June **NATURAL HISTORY** *1941*

Grand Canyon no one has seen • The Vanishing Caribs

New Dinosaur • Mystery Monuments • Rubies & Pearls

UME XLVIII, No. 1

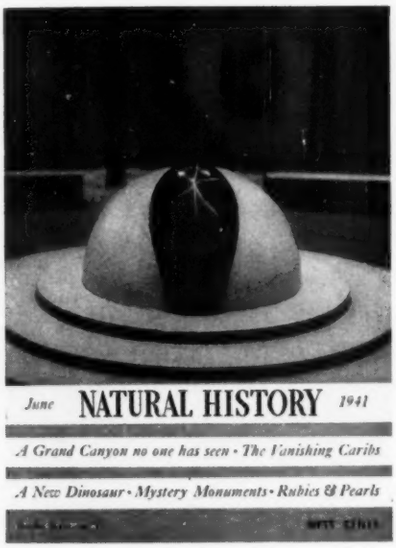
FIFTY CENTS

LETTERS

THE COVER THIS MONTH

The cover of this issue of NATURAL HISTORY bears a color photograph of the largest fine star ruby in the world. It is the 100-carat Edith Haggin de Long Star Ruby, one of the finest specimens in the gem collection of the American Museum.

The beautiful six-rayed star that glows within the gem is the result of a hexagonal pattern of fine tubular cavities within the ruby. These myriad tubules reflect the light from within when the stone is cut in the form of a dome.



This striking color photograph is probably the finest reproduction of a star ruby that has ever been achieved. The gem is on display in the Gem Hall of the American Museum, where it resides in the dramatic setting designed by William Bayard Okie, Jr.

* * *

SIRS:

The NATURAL HISTORY Magazine covers are most attractive. Is it possible to obtain cardboard replicas such as are displayed on newsstands to advertise the magazines?

I am a Life Member and a teacher in the elementary schools of New York. Many of your covers can be used in Nature lessons. But I do not like to deface the magazine by removing the cover. I shall be glad to come for the pictures if any are available.

May's cedar waxwings are delightful, and April's blossoms were beautiful. I should like those very much for the schoolroom.

(MRS. MYRWIN L.) MILDRED EATON.
New York, N. Y.

NATURAL HISTORY Magazine's full color covers are available not on cardboard but on the same heavy paper that is used on the Magazine at a cost of 5¢ each, plus a charge of 5¢ for postage on any order up to ten copies.

—ED.

* * *

SIRS:

I am very sorry to have to inform you that when my current subscription runs out for your most enjoyable and informative magazine, I shall not be able to renew it.

Owing to exchange difficulties, it is now illegal for money to be sent out of Australia except for sustenance, and although I tried to plead that my "mental sustenance" was helped by your publication, I was not permitted to apply for a money order for this purpose. . . .

I have always enjoyed reading NATURAL HISTORY, and when I have finished each number I send it over to friends in Taupo, New Zealand, where it is passed round the district and brings much pleasure. . . .

ESTHER BUCK.
Newcastle Girls' High School,
Hamilton, Australia

* * *

SIRS:

As a source of supplementary material for informal talks and class discussions, NATURAL HISTORY's educational value is inestimable. Its wide range of subjects in its own field appeals greatly to the boys here, who find it not only informative but extremely interesting. I sometimes wonder what we would do without it.

Your pictures are splendid, if not the best, but for readers who may be interested in photography may I suggest that more photographic data be given whenever such is available.

RODERICK HAGENBUCKLE.
The Fessenden School,
West Newton, Mass.

* * *

SIRS:

In a recent discussion of the homing instinct of various animals, mention was made of experiments with a toad. The experiments were made somewhere in the vicinity of Boston.

I wonder if you could give me some further information concerning these experiments or suggest some publication containing the information?

FRED S. JOHNSON.
The Bowery Savings Bank,
New York, N. Y.

Mr. C. M. Bogert, of the Department of Herpetology in the American Museum, gives the following brief summary of what is known:

Most of the information regarding am-

IMPORTANT NOTICE TO MEMBERS

NATURAL HISTORY is not published during July and August. Those members, however, who wish to have their September issue sent to a temporary summer address are requested to notify the Membership Secretary, giving the date at which they will return to their permanent address.

phibians has been summarized by the late Dr. G. K. Noble in his *Biology of the Amphibia* (McGraw-Hill, 1931), but one or two papers dealing with the subject have appeared since. The note to which you refer was apparently an account of questionable reliability published originally in the *Overland Monthly* and quoted recently in a popular digest of "tales of the homing instinct."

The author of this note stated that a toad taken from his garden in Wakefield, Massachusetts, was liberated at a spot ten miles from there after being carried on a train through Boston late one evening. The following afternoon, and hardly 20 hours later, the same toad was reputedly back in his home garden. Unfortunately the scientific work done in recent years does not corroborate this story. In his study of the movements of toads, Ray J. Nichols in 1937 reported that of 570 toads tagged and liberated, the maximum distance traveled by any toad in returning to the exact point of capture was 725 yards. Another toad recovered "toward the point of capture" had traveled 1150 yards. The maximum speed Nichols recorded in toads returning to the point of capture was less than one-tenth of a mile an hour, hardly comparable to the alleged speed of half a mile an hour purportedly averaged by the single toad liberated near Boston. Of 141 toads that Nichols removed one mile or less from the point of capture, he was able by intensive work, to recover only 63, and of this number only 30 were at the point of capture in from two and one-quarter hours to 24 days after their release.

The toads which Mr. Nichols was dealing with were mostly Fowler's toad, *Bufo fowleri*, the species most likely to be found in gardens of the Boston suburbs. The logical assumption is that the scientific work is the more reliable, and that the popular account is open to considerable doubt so far as the accuracy of the toad's traveling ten miles in less than 20 hours is concerned.

However, there is every reason to believe that the homing ability in certain amphibians is fairly well developed, particularly in the tailless forms. Under normal conditions many toads regularly return to the same shelter night after night, after spending the evening foraging for insects. During the breeding season many species of frogs will come forth from their retreats at night and return to exactly the same calling station. I found this to be true of a dozen American bullfrogs that I had introduced one spring at a small lake on the edge of the Mojave Desert, far from their normal habitat. This lake had previously been inhabited only by toads and tree frogs, but within a week after I had introduced the bullfrogs, each of about 10 large males had taken up positions at definite localities along the edge of the lake. On subsequent week ends when I visited the place, I invariably found frogs calling at precisely the same places.

In Panama, Dr. C. M. Breder, Jr. discovered that male tree frogs (*Hyla rosenbergi*), which construct mud basins for the rearing of tadpoles, returned on successive evenings to the same basins. Doctor Breder, with Mrs. Breder and Redmond, also published reports on experiments that were conducted in Palisades Interstate Park and near Haskell, New Jersey. Here he found that specimens of Fowler's toad (males) "would sometimes travel at least one-quarter of a mile in less than 24 hours over very difficult paths and surmount numerous obstacles to return to their 'home' territory." Two out of three green frogs released several hundred feet away from their home springs returned even though they had to cross bodies of water where equally suitable habitats existed and where other green frogs were dwelling. It is possible in this instance that other male frogs had already assumed "control" of the suitable stations and did not permit intruders to remain in their territory.

Just how these animals manage to return to their home stations is not known. Some investigators have concluded that amphibians rely upon a number of visual impressions and that new scenes are avoided because they "arouse discordant feelings." Work done by Doctor Yerkes nearly 40 years ago suggests that vision plays some important role in the homing ability of frogs, even though much remains to be explained. Yerkes found that green frogs learned their way through mazes without much difficulty. In an effort to find out what cues were being used he arranged a maze with the walls of one alley red and the other white. After the maze had been learned by frogs, he reversed the colors, and found that frogs were obviously confused. They selected the blind alley instead of the outlet although on previous trials they had learned the maze so well that no mistakes had been made.

Salamanders, oddly enough, seem to show little homing behavior and usually do not return to the same retreats. But they are, nevertheless, able to learn their way through mazes.

Considerable interest has lately been centered on homing behavior, and I imagine some interesting facts will be brought to light. The fact that rattlers as well as some other snakes congregate in winter "dens" in the colder portions of the United States suggests that they possess some ability to find their way to their home dens. The researches of Dr. A. M. Woodbury of the University of Utah have lately shown that desert tortoises also congregate in winter dens but disperse during the summer to establish individual burrows that serve as bases for their activities. The movements of birds have long been studied by attaching identifying tags to individuals, and now similar methods are being used in studying the movements of many other vertebrates, from fish to mammals. Doctor Woodbury has found it possible to tattoo identifying marks on the bellies of snakes; but in most of the frog experiments cited above tags of various sorts were attached to the animals so that there was never any question concerning the movements of individuals. Usually nearly half of the individuals tagged were recovered in the case of amphibians, but with other groups of vertebrates, recaptures have not been so successful.

This will give you some notion of what is known concerning the homing ability of toads, and certainly some of the evidence is very convincing. However, we still doubt that the toad traveled ten miles in less than 20 hours through the streets of Boston. We do not like to spoil a good story, but the substantiated facts are interesting enough, and I look forward to seeing more experimental work done with the homing of amphibians.

* * *

SIRS:

. . . I seldom write letters of comment but I do wish at this time to express my great enjoyment of your magazine. In these times of strain and worry many of us are all too apt to forget to take comfort and refuge in more lasting and dependable interests. Also, city dwellers . . . cannot always get away, physically or mentally, as often as they wish.

We have to plan our vacations very carefully and we have followed up very happily several ideas suggested by NATURAL HISTORY. The most interesting experience was one of our most exciting adventures. Several years ago, following an article on the ice caves in Grant, New Mexico, we set out on a side trip to see the one described. We found it after a good deal of difficulty, and . . . wound up on the Cibola National Forest lookout, and were charmingly entertained . . . by the Ranger, his wife, and three sons. Our objective that night had been the Continental Divide, and it happened that our tent had been pitched squarely across it. . . .

We were so glad the article made the side trip sound more practical than it really was. We didn't really have time to do it but wouldn't have missed it for anything.

(MRS. C. W.) HELEN TALBOT CORELL.
New York, N. Y.

* * *

SIRS:

I have duly received the last number . . . and I am glad to congratulate you on this publication, very fine and useful to me and to the world of naturalists . . .

A. L. HERRERA.
Sociedad internacional de Plasmogenia, Mexico City, Mexico

* * *

SIRS:

. . . You may be interested to know that for years our copies of NATURAL HISTORY have been traveling to the ends of the earth, and in instances they have gone to places where they and other items in the bundle were the only reading matter in English. For some time the Magazine has been forwarded to a friend in Australia who gives two afternoons a week to read to the men blinded in the first world war. And since the present war started, her son-in-law has been with the troops, so that NATURAL HISTORY goes to Australia, is quickly read there, and then is sent (by Air Mail) on to Dick—who was for months in Palestine, and later in Egypt with Wavell. I wish one copy could write back and report on its travels.

So I send my deep appreciation of a fine task done so well that it inspires those who see and hear and read.

MRS. RAY CLARKE TILLINGHAST.
New York, N. Y.

* * *

SIRS:

. . . complimenting you for the fine magazine you publish . . .

MORTON KLEIN.
Brownsville, Pa.

Continued on page 62

NATURAL SCIENCE SPEAKS TO MAN

LINNAEUS, in his *Systema Naturae* (1759), classified all the then known species of animals, plants, and minerals. Just below the angels and at the head of terrestrial creatures Linnaeus placed the Primates (Latin, *chiefs*), beginning with *Homo sapiens* (man) and passing downward through the various species of Simia (apes and monkeys) to the lemurs and the bats.

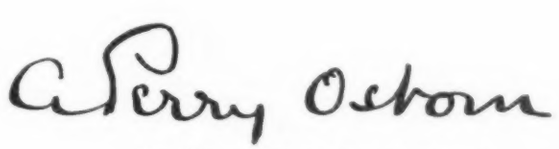
Eighteenth century man could not accept this ruling without protest. Gratified at being placed next to the angels, he could not endure the idea of being bracketed with monkeys. Writes Thomas Pennant (1781), "I reject his division—because my vanity will not suffer me to rank mankind with Apes, Monkeys and Bats."

Charles Darwin (1871) suggests that, "as man from a genealogical point of view belongs to the Catarrhine or Old World stock [of monkeys and apes], we must conclude, however much the conclusion may revolt our pride, that our progenitors would have been properly thus designated."

Man's origin, going back millions of years to the earliest backboned animals, is today accepted by all natural scientists, yet great numbers of people still refuse to accept such lowly relationship, and even scientists like Pennant and the great Darwin at one time were gravely disturbed.

As the Natural Scientist sees it, man lives in two worlds, the natural world and his own man-made world. In the latter, man is confused by a babel of different languages, mutually conflicting tribal traditions, superstitions, codes and cults; and long records of history, knowledge, and thought only seem to add to his confusion. But although man is apt to think he lives exclusively in his man-made world, the urges or instincts which drive him to action come from his natural world. And it is the service of Natural Science to bid man remember that he is but mortal and that it behooves him to walk humbly, not with vanity or pride.

Natural Science says to man, "Before considering action in your man-made world, know yourself and your place in the world of nature. Since you have been endowed with the priceless freedom of choice, you, alone of the animal world, may deal with your age-old natural urges or instincts. Choose between two instincts if you will—either co-operation with your fellow creatures or force urged by self-aggrandizement and fostered by pride and vanity. Both instincts are of ancient origin in your animal make-up but lead to basically different results. Co-operation, the instinct of the family, herd, and flock, you have never chosen and adhered to on the grand scale. It might bring your man-made world to an enduring brotherhood—enduring, biologically, because co-operation should encourage self-development. Force, self-aggrandizement and individual advantage you have often tried and so set up your many man-made worlds headed by the Caesars of history. These worlds have always perished and, although climate and disease have played a part, the destruction of such worlds is in the main caused by the decadence of inhabitants who have lost their freedom and consequently their initiative and virility. Why not try co-operation?"



First Vice-president of the Board of Trustees,
The American Museum of Natural History

For further reading along these lines, see W. K. Gregory's "The Orders of Mammals," *Bulletin of the American Museum of Natural History*, XXVII (February, 1910); and "Nature's Upstart: *Homo Sapiens*," *The Teaching Biologist*, V, No. 2 (November, 1935); also M. D. Stevers' *Mind through the Ages* (Doubleday Doran, 1940)

"I judge the telephone company by the people who work for it"

A little while ago a Vermont newspaper editor, John Hooper, commented on the telephone company and its people. His words express so well the ideals toward which we are striving that we quote them here.

"I DON'T know how big the telephone company is, but it is big enough to exceed my mental grasp of business.

"But I don't find myself thinking of it as a business, even in my day-to-day contacts. Rather, my attention is on the voice that says, 'Number, please.' I find myself wondering if that voice is feeling as well as it always seems to, or if it feels just as hot and weary as I do, and would say so if it wasn't the kind of voice it is.

"The first time the business angle really struck home was when I read that my friend Carl had completed thirty years with the company.

"Now it happens that I know something of the details of those thirty years with the company, and I believe they are a credit both to Carl and to the big business for which he works.

"In 1907 Carl was a high school boy confronted with the need for earning money in his spare time. He happened to get a job as Saturday night operator in the telephone exchange. He worked at this job for three years and then entered the university.

"While in college he did some substituting at the exchange in his home town in vacations. After graduation, he was hired full time by the telephone company, not in an 'executive' position which some folks think goes with a college diploma, but as a lineman.

"Within a year he was made wire chief of the district, a job which he held for the next ten years. He was then transferred to a larger city as manager of the office. Then he was promoted to sales manager of the division.

"A year later he was sent to another State, as district manager. In less than a year after this appointment, he was made manager for the entire State.

"I don't know much about the telephone company as a business; I can only judge it by the people who work for it. Just where the dividing line is between a business and the people who work for it, I don't know. I don't think there is any line."

Bell Telephone System

"THE TELEPHONE HOUR" IS BROADCAST EVERY MONDAY. (N. B. C. RED NETWORK, 8 P.M., EASTERN DAYLIGHT SAVING TIME.)

NATURAL HISTORY

The Magazine of the American Museum of Natural History

FREDERICK TRUBEE DAVISON, President — ROY CHAPMAN ANDREWS, Sc.D., Director

VOLUME XLVIII—No. 1 ★ ★ ★ ★ ★ ★ ★ **JUNE, 1941**

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I'LL TAKE T

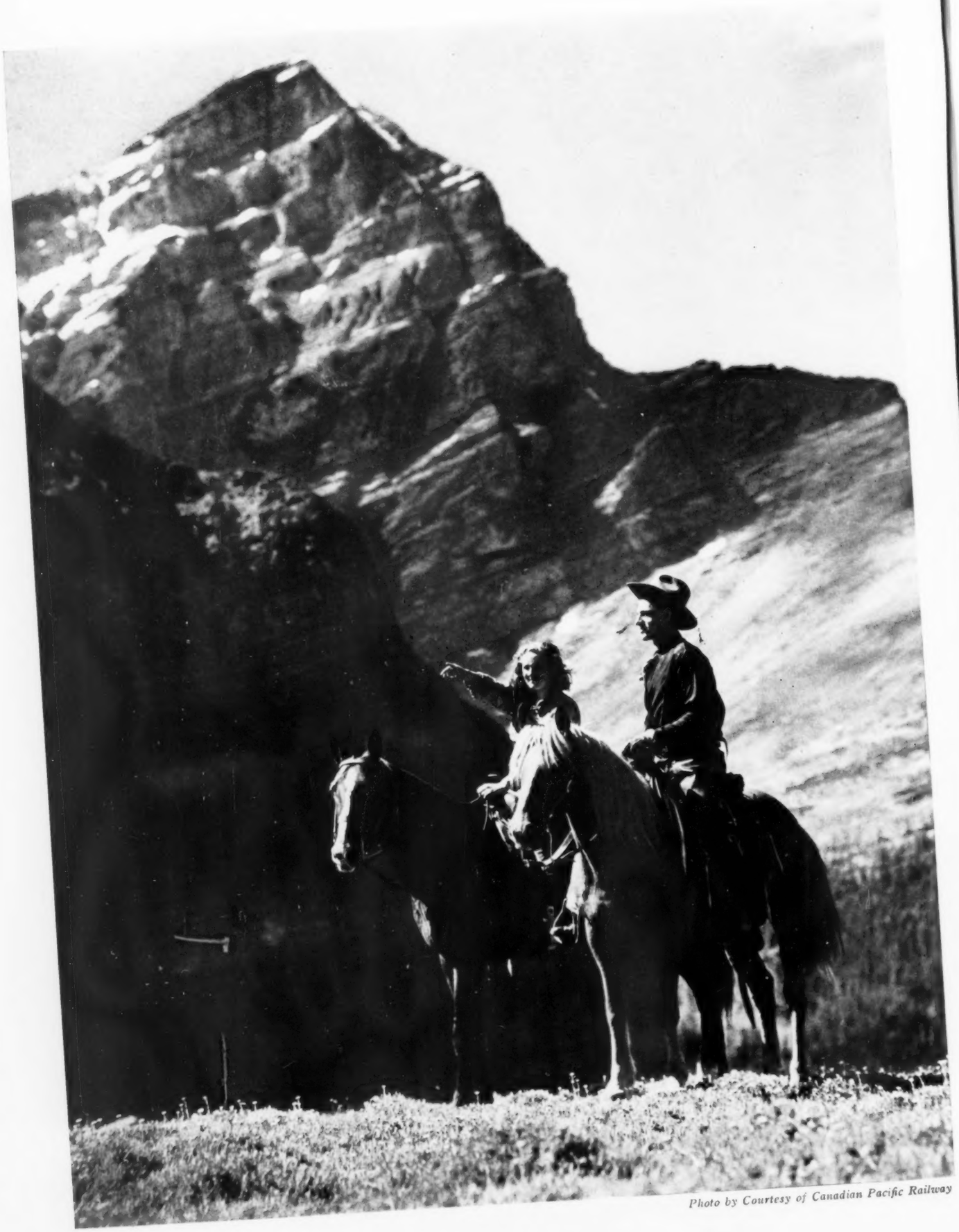


Photo by Courtesy of Canadian Pacific Railway

THE HIGH ROAD

Here are two roads to nature. One of them lets the wilderness alone, enables the nature lover to smell it, feel it at leisure, soak it in through all his senses. The other?—Well, take your pick

By DAVID LAVENDER

PROBABLY no one is recipient of more unwanted favors than is the poor nature lover. Every Chamber of Commerce that dreams of increasing automobile traffic in its area takes him to its ample bosom. Contractors who can't tell a goldfinch from a trailing arbutus; bond salesmen and purveyors of road machinery; manufacturers of cement and drain pipes; labor leaders and advertising writers—all these and others are his most solicitous friends. He likes nature, doesn't he? Then build him new roads so he can see new sights. What could be more generous?

It is, of course, impolite to bite the hand that feeds one. Besides, the amateur naturalist is an inarticulate sort of fellow whose main desire is the undramatic one of being left alone. Rather than kick up a fuss by appearing ungrateful, he quietly moves out of each new region his friends open up for him and goes on to the next hill or valley.

But more and more he is wondering how long his few remaining hills and valleys can hold out. The wilderness—the inexhaustible American wilderness—is dying before his eyes.

This has been said many times,—so many that it has brought forth rebuttal. I read not long ago statistics that showed conclusively that half of the United States is uninhabited and almost certain to remain so. The author pointed to the Florida Everglades, the great deserts of the Southwest, and the rearing Sierras of California; to the vast gorges of northern Idaho, the trackless bayous of Louisiana, and the spreading pine forests of eastern Texas; to the state of Nevada with a population less than that of Trenton, New Jersey; even to the rocky, grudging hills of New England. He proved, in short, that nearly every state embraces certain profitless localities which can never be settled by more than a few strange outlanders,—and these outlanders add to the region's picturesqueness.

He is doubtless right,—so far as *settling* goes. But he forgets the automobile. Drag a scar of asphalt along the lovely flank of any wilderness, and instantly it ceases to be a wilderness, though not a single "permanent" settler is added to the census taker's list.

Even this is pooh-poohed as an alarmist's point of view. I was grumbling recently to a representative of an automobile club about an improved highway that is slowly being pushed into the Navaho country of northern Arizona. It seemed a wanton thing to me. In the colored desert surrounding Kayenta and in the shadows of the stark red buttes of Monument Valley is one of the last places where the Navaho can live as he used to live, speaking little or no English, content with his hogan of brush or mud, unashamed of his straight, uncut hair done up in a gaudy calico band. Around Shiprock and Gallup, or wherever the main highways run, the Navaho has cut off his hair and aped other "civilized" ways, not always to his benefit. It struck me as a pity, I ventured, that these people could not be allowed one spot where they might cling to the heritages of a past far older than our own.

"Pooh," the auto man said. "One road isn't going to change this whole reservation. The country's so big, and it would cost so much to reach all the back regions that some of your wild men probably never will see an automobile unless they come in to the central trading posts."

IN NATURAL WONDERS easily accessible to the summer tourist, North America has a heritage of unrivaled diversity and beauty.

In California alone one could spend two weeks every summer touring only on National Forest and National Park highways and never see them all in 28 years

YET with all this natural beauty for the asking, private interests increase the pressure for roads where none are needed and lace up our scenic outdoors with a network that brings destruction to almost every form of natural beauty. It is time to stop the billboard panorama

Photo by E. W. Van Wagenen from Black Star

So big. So many back regions. It makes us—always has made us—criminally careless of our riches.

I spent my boyhood on a ranch in the San Miguel Mountains of western Colorado. I remember my stepfather's telling me that when he and other ranchers first came into the section, they looked at the endless sea of grass and told each other it could never be grazed out. Today the vast herds of cattle they brought in are gone. Arroyos yawn where storm waters roar off the denuded hills. Ranches have dwindled to small units carrying on business behind barbwire fences. Those men have learned that nothing is so big as to be unlimited.

I went back not long ago, thinking to hunt some of the sage chickens which used to swarm in every draw, on every brushy mesa. They, too, are gone. But there is a road. I remember when it was built and the first gunners it brought. And when I think of that I can't help recalling the cold mountain dawns when my brother and I would pile shivering out of bed to meet each new morning with a boy's unquestioning delight.

It was our job to bring in the horse herd. Off we went riding double on a barebacked old "night" horse we had kept tied in the barn. I can still smell the hay on his frosty breath, still feel his warm hide between my dangling legs. The long grass glittered with dew. The rising sun washed the peaks with a golden light that threw each timbered fold into sharp relief.

Suddenly a soft, muttered clucking off in the sagebrush would bring us out of our dreams. We would slide off the horse and creep forward, taut with excitement. When the old cock guarding the covey craned his mottled neck over the scrub, we were ready. *Whir-r!*—we could really peg rocks in those days! Then, after we'd brought the horses thundering into the corral, we would clean our prize and race into the cabin to watch mother fry him in a pan of hot bacon grease. The smell of him was even better than the eating.

Sometimes—high moment!—my stepfather would take down his beloved shotgun and whistle for his two black-eared setters. The dogs were a luxury there where you could flush a multitude of birds in any half-hour walk. But he liked to see them coursing the fields or freezing to stiff, eager point.

Like our neighbors he never killed more than we could use and only when fancy dictated. Consequently we couldn't understand it when, shortly after the new road between Norwood and Dolores was opened, two gunners stopped by and in a single afternoon killed 175 prairie chickens. I am sure of the figure. I saw the back of the car piled high with their slaughter. And I read the account of the trip they wrote up for their home town paper. One hundred and seventy-five in one afternoon. They mentioned the number several times, as though they were proud of it.

Until that day I had thought that gunners were sportsmen. Certainly the ones were who took the trouble to get into our back country before the advent of the road. They liked the beauty of the land as much as its hunting. They respected our grain fields and grazing stock. Above all, they respected the game.

Spoliation

The new road brought in an entirely different kind of being: a man who, if he saw the dawn or violet dusk at all, saw it through a windshield at 50 miles an hour; who kicked down fences, trampled grain and was in such a hurry to kill that he left the trouble of finding his crippled birds to the coyotes. He was the game hog and, game laws notwithstanding, he appears on each new wilderness road as surely as does the billboard.*

A wilderness area in the United States long ago ceased to mean a region awaiting exploration or development. Its connotation now is of a spot noteworthy either for scenery or game and sufficiently remote from roads to require the average camper's staying at least overnight in a bivouac of his own making.

In a country half uninhabited such areas are surprisingly few and far between.

For example, in all California, second largest state of the Union, there are only seven wilderness sections a man can't hike across in a short day. Of these seven, only two are more than ten miles from the end of some existing automobile road. One of them is, of course, truly vast: the famous High Sierra region, some 2,300,000 acres in extent.

Two other sections, surpassing even the Sierras in size, stand out in the wilderness lover's mind. One is the grotesquely carved, highly colored land that lies along both rims of the Colorado River from eastern Utah south into Arizona, a territory of 10,000 square miles more or less (depending on how far up the many tributary canyons its boundaries are conceived to extend). The other is the thundering gorge of the Salmon River in north central Idaho, the largest tract of untrammeled game country left in the United States.

Formidable lands, these three, offering almost nothing in the way of economic exploitation. Yet look what is happening to them.

*The automobile itself has become the unnatural enemy of myriad mammals, birds, reptiles, and amphibians. Hit-and-run motorists who never pulled a trigger may unintentionally wreak even greater havoc among wildlife than the willful depredations of the game hog. Some estimates place the automobile's toll of small mammals alone at a million a week during early summer.—Ed.

It is now officially proposed that a National Monument be created in Utah, starting near the Arizona boundary and embracing both banks of the Colorado as far as Arches Monument, near Moab, and including also the Colorado's main tributary, the Green, as far north as the town of Green River.

Today a single highway barely nicks the eastern edge of this enormous territory. It is a one-way dirt road, passable only in summer, and leads to Edwin, or Owochomo, Natural Bridge at the head of White Canyon. This road, it is argued, should be made into an all-weather highway and extended on down White Canyon to the Colorado, across the river and out the other side, thus splitting the region in half. Eventually, if the proponents of the Monument have their way, other roads will scar both rims of the Colorado, but as a starter they are willing to settle for the first one mentioned.

Not even the most rabid booster of the project pretends that this costly highway will benefit the region itself. The entire population of 200 or 300 miles of the canyon bottom could be taken out in a single car. One lone cattle company grazes stock along the rugged east breaks, and its owners have declared themselves unalterably opposed to the road. But the boosters are not dismayed. They still have, as an argument in favor, their old standby, the nature lover. Just think of the scenery it would open up for him!

"What scenery?" one timidly asks. The deep, colorful gorge of the Colorado? It is deeper and more colorful where roads already exist: in Grand Canyon National Park. The breathless precipices and templed rocks of its great buttes? There are greater buttes in Zion Park. The fantastic erosions of wind and water? Bryce Canyon is more fantastic.

The same threat is even more real for the Salmon River in north central Idaho, Paradise of hunter and fisherman. Already a road has reached down the mainstream from the town of Salmon to the Middle Fork. The CCC, those unflagging zealots of the road-building fraternity, are blasting upstream from the town of Riggins. Now only a hundred miles separate the converging road ends, and two local Chambers of Commerce are whooping it up for quick completion. And what is to pay the enormous cost of constructing and maintaining this highway? Why, a tiny one-family mine here and there, a couple of hat-sized patches of arable land,—and the grateful nature lovers who will flock in with open purses.

One wonders how grateful the nature lovers will really be. In the minds of hunters, campers and fishermen everywhere the Salmon is, above all else, "The River Of No Return." It is so called because, though it is possible for the venturesome to go downstream by boat—"the wildest boat ride in America,"—no one has yet been able to return upstream. The road will end all that. And more. It will end fishing and hunting—steelhead, salmon, trout; deer, wildcats, bear, mountain sheep and goats,—unrivaled anywhere else in the United States.

If you doubt the desecration of roads, look what has happened to some of the tributaries of the Salmon. At Bear Creek, for example, you once could tumble out of your sleeping bag and in half an hour catch all the fish you wanted for breakfast. Now you'll cast all day for a measly mess of six-inch trout. The man who lands one of the salmon for which the watershed was named makes news.

After all this it would be repetitious to tell about the road which the State of California has gouged into Kings River Canyon, the very heart of the High Sierra wilderness; of another that is in the planning stage and will cut the body of this wilderness in two, crossing the entire range from Porterville to Lone Pine and "opening up" the Kern River region.

The motorist already has available to him the lion's share of the finest mountain scenery in the United States: in Glacier, Ranier, Rocky Mountain, Yellowstone, Yosemite, and Sequoia National Parks, —to say nothing of tens of thousands of highway miles which, though not built primarily for scenic attractions, nonetheless afford plenty of them. In California alone, he can drive more than 100,000 miles. The average man, on an average two weeks' vacation trip, could not see all California's roads in a hundred years. He would use up 28 years of vacations just touring that state's National Forest and National Park highways alone.

Meanwhile, bottlenecks and bad crossings

Highway engineers say that before a modern road can pay for itself it must carry 400 cars a day every day of the year. The average purely "recreational" road draws less than 100 a day. And still the pressure is on for more, although California's highway department repeatedly points out that all available funds are necessary to maintain and improve existing roads. Meanwhile traffic arteries, which serve a definite economic function, remain full of bottlenecks, dangerous curves, and railroad crossings.

It is impossible for the true wilderness lover to see the country from a speeding automobile. He has got to absorb it leisurely, sleep right down on the ground, smell it, feel it, soak it in through all his senses. "Improvement" on nature is, to him, incredible,—yet hand in hand with road building has gone improvement. Underbrush has been cleared out and burned, killing nesting birds and making room for

the noxious plants of ragweed, burdock, and thistle. Trees have been thinned out, logs removed, whole forests combed and manicured. Famous wilderness trails have been slicked up, notably the Appalachian Trail in the Great Smokies. It would be interesting to know, now that the publicity attendant on that work no longer acts as a magnet, how many more people use the trail than before. Isn't it possible that its main devotees were those to whom it appealed because it was a natural, "unimproved" pathway?

It is said that this clean-up campaign is a fire preventive. But it won't check half as many fires as would the weeding out (if he could be weeded out) of the thoughtless camper brought in by the roads. Meanwhile what of the birds and small game that need the cover and food provided by an abundance of undergrowth and down timber? What of the violets that bloomed by that mossy log? The azaleas that rioted in the thicket?

This is not just the protest of an occasional recluse. Last summer nearly 140,000 people went into California's wilderness areas alone. They did it in what the motorist would call "the hard way." They walked or rode horseback. They carried their supplies on their own backs or packed them on mules. They cooked their own food, made their own beds, cleaned up their own mess. And they did it because they liked it. Because there seems to be in some men and women an inherent craving for pioneering, for outdoor "adventure." Because they can find in the solitude of the soaring buttes or beside the untracked streams a few simple values for living that are overlooked in the rush of the cities.

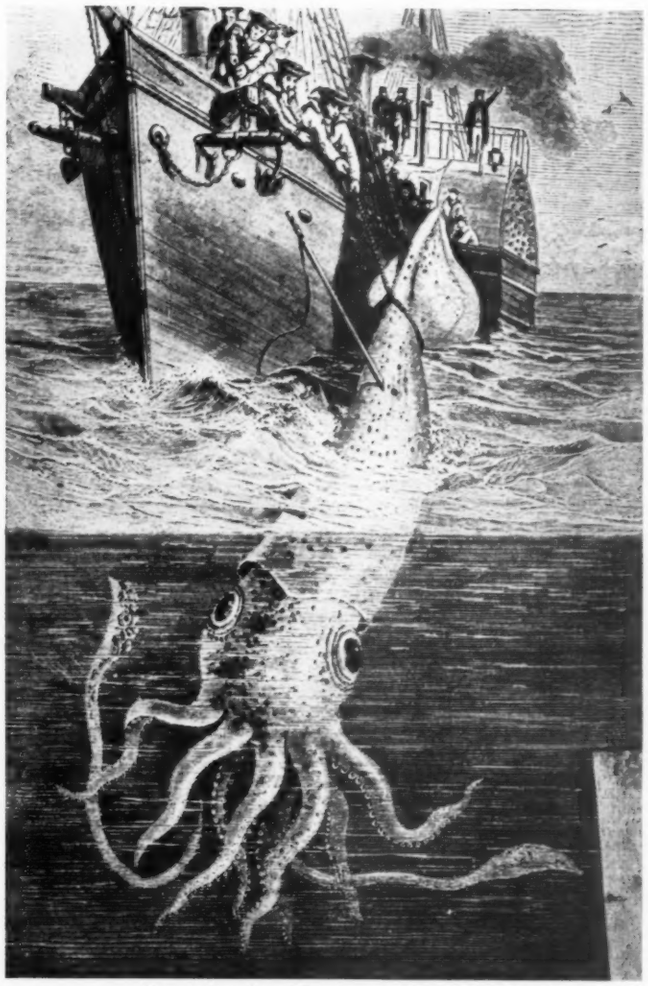
More roads will bring the motorist nothing that is not already available to him over and over again. But to the wilderness lover they will bring more fires, more erosion, fewer trees, smaller streams, less fish and game.

Isn't it time we stopped giving the poor fellow so much?

Philip D. Gendreau photo

SCYLLA WAS A SQUID

By W. LEY



Illustrations from Monsters of the Sea, *by John Gibson, 1887*

NEARLY all mythical monsters have a basis in fact. The creature at right is the artist's conception, but the inspiration is obviously the giant squid. This drawing depicts the encounter of the *Alecton* with a giant squid, in 1861

Charybdis may have been a whirlpool, but modern science now recognizes the other half of Homer's legendary partnership in maritime disaster as possibly the first mention in literature of the giant squid

IT WAS on the last day of November, 1861, that the lookout man on duty on the French corvette *Alecton* announced: "a large body, partly submerged, on the surface." The vessel's position was about 120 miles northeast of Tenerife, the largest of the Canary Islands; the sea was calm in the oppressive heat of a clear sky, and the commander of the corvette decided that the object should be approached and investigated. It turned out to be a gigantic squid of a bright brick-red color, with immense black eyes that were not easy to look at. The body of the monster was about eighteen feet long, the tentacles at least another eighteen feet and the weight was estimated to be about two tons. The squid was drifting lazily at the surface but was unmistakably alive.

The commander of the *Alecton* knew that the existence of such gigantic squids was still disputed, although only recently a few dead and mutilated monsters of that or a very similar type had been washed ashore, one off Zeeland, Denmark, in 1847 and another at the Skaw in the same region in 1854. This encounter with a live animal afforded an excellent opportunity to settle that disputed question once and for all and to furnish a belated vindication for the commander's compatriot, Denys-Monfort, who had published a complete collection of all reports referring to such animals in his *Histoire naturelle . . . des Mollusques* in 1802 without earning anything but ridicule for all his work.

Since the *Alecton* was a war vessel, there was no lack of armament. Cannon balls were shot at and through the lazy kraken (to use the old Scandinavian word for the fabulous sea monster); and harpoons were thrown at it. But it seemed as if no projectile

could seriously or even perceptibly damage the flabby flesh of the squid. Nor did the creature seem much disturbed by the belligerent attention paid to it. It disappeared under the surface three or four times, only to come up again each time after intervals of a few minutes at most.

After three hours of intensive naval warfare, the squid suddenly vomited (one of the cannon balls must have hit a vital spot). And soon after, one of the sailors succeeded in throwing a noosed rope around the body. The rope slid along the slippery sides and finally caught at the large rear fins. The men tried to haul the gigantic cuttlefish aboard, but its weight was so great that the rope cut through the body, severing the hind part. This part was salvaged but had to be thrown away soon after. Thus the *Alecton* reached port with empty holds, but captain and crew brought an exciting tale to tell.

As has been said, the existence of giant squids was not generally recognized at that time. (They came to be recognized between 1870 and 1877, when not less than a dozen of the monstrous creatures were washed ashore at Newfoundland, some of them still living.) Therefore some armchair explorers quickly and gravely informed the captain and ship's company that they must have been the victims of a mass hallucination.

To those who put that interpretation on the adventure it sounded perfect. But to the men who had worked for hours under a tropical sun to secure a heavy and repulsive specimen, being in various kinds of danger all the time, that explanation did not seem so correct. It is regrettable that history has the habit of recording only the sayings of politicians and diplomats,—the remarks the French sailors made when suspected of mass hallucination were never printed.

Before those gigantic squids were seen and examined by zoologists,—the one that was battled by the *Alecton* is by no means the largest on record—, knowledge about the existence of such animals rested mainly with the writings of two Scandinavian authors, both of them famous, both immensely learned, but both also given to exaggeration and a peculiar credulity. The older of them is Olaus Magnus, "Archbishop of Upsal and Primate of Sweden," who delivered a vivid description of the kraken (the common use of this Norse term goes directly back to these two authors) in his *Compendious History of the Goths, Swedes, Vandals and Other Northern Nations*. He said that the kraken had "long horns round about like a Tree rooted up by the Roots." And he did not forget to mention the large eyes, telling that they "are red and fiery colored and in the dark night appear to Fisher-men afar off under Water as a burning fire."

The other, Bishop Erik Pontoppidan, wrote about the kraken in the second volume of his weighty *Natural History of Norway*. The book was written in 1753, and an English edition appeared in London in 1755. Since "none of the authors, both classic and modern," consulted by Pontoppidan, "seemed to have much knowledge of this animal," he had to rely on tales of Norse fishermen and on their folklore. The tales were sensible, as we now know. One of them relates that a kraken, "perhaps a young and careless one," was caught between cliffs and trees near Alstahong in 1680 and died when the tide receded. The folklore part was less sensible, speaking of a kraken a mile in circumference, appearing above the waters like a group of small islands.

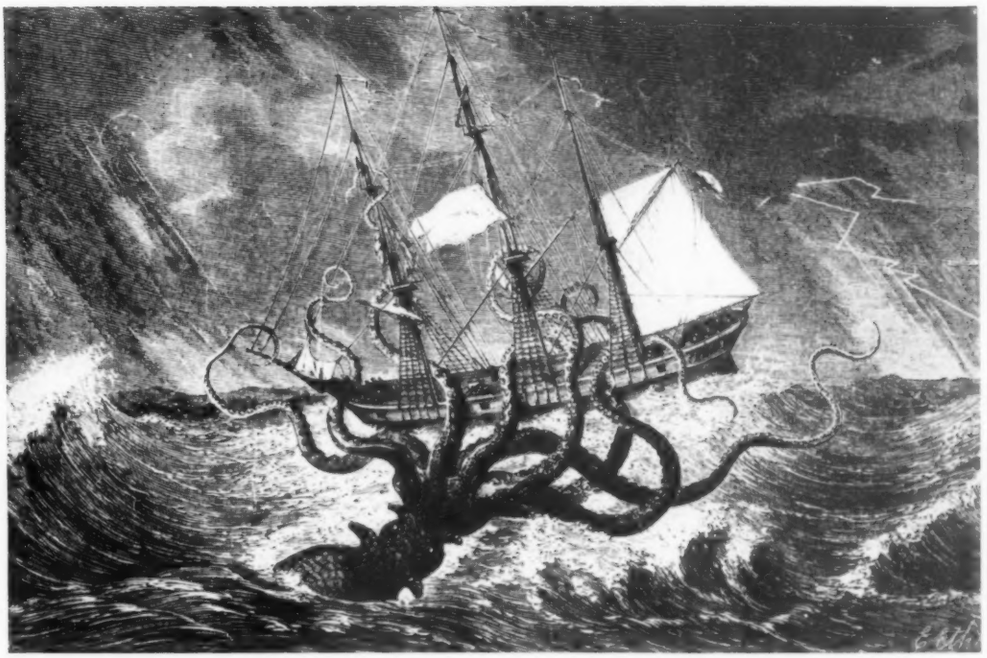
It was because of this story that the existence of giant squids was doubted and ridiculed for more than a century after the first printing of Bishop Pontoppidan's book.

In ancient lore

It is, incidentally, not true that the works of the classic authors do not contain references to the existence of gigantic squids. The best known reference in classical times (and probably the most reliable one) is that in the *Historia Naturalis* of Gaius Plinius Secundus, better known as Pliny the Elder. He reported that "more than a century ago" (which would be around, say, 100 B.C.) a gigantic cuttlefish was caught in the strait between the Pillars of Hercules (Gibraltar). Its head was "as large as a keg holding fifteen amphorae of wine, and the arms were 30 feet long and so thick that a man had difficulties to reach around them."

But even that is not the oldest literary mention of a giant squid. There exists one of much greater age, and it can be found in one of the most famous books of the world's literature, in Homer's *Odyssey*. It is certain that this poem did not undergo even small changes from the time of Peisistratus (530 B.C.), though Homer is usually thought to be an approximate contemporary of Hesiod, which means that he probably lived around 750 B.C. Now it is rather unimportant whether Homer is to be regarded as an historic person or not, or whether he is thought to be the author of the *Odyssey* or only the compiler of older material. The wording of the poem is at least 2500 years old, the material two or three centuries older; and no matter who wrote certain passages, they convey to us what was known or at least believed 2500 years ago.

The mention of a giant squid occurs in the Twelfth Song, where Circe describes to her hero the dangers of Scylla and Charybdis. Again, it is of little importance in this connection whether Scylla and Charybdis



ANOTHER example of reasonable accuracy in fanciful art. The giant squid became generally recognized as a real animal in the 1870's

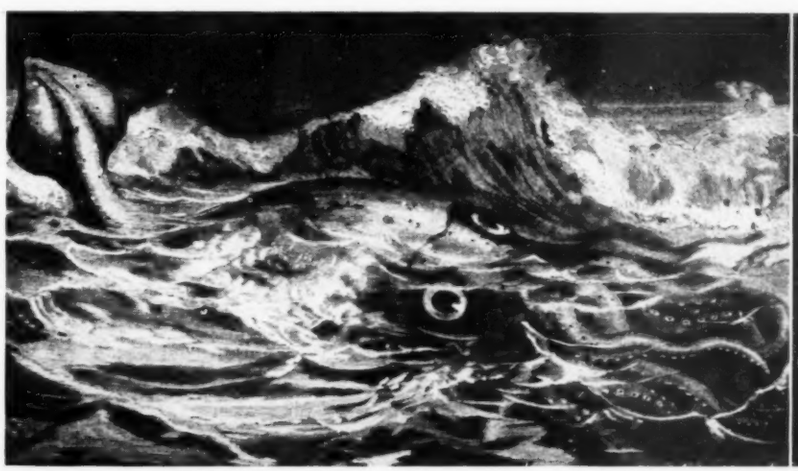
are thought to refer to the Strait of Messina beween Sicily and Italy or to the Strait of Gibraltar. The older school of thought asserted that the Greeks of that period did not sail the Mediterranean farther west than to Sicily, while more recent commentators point out that more extensive geographical knowledge may be embodied in the poem.

But there can be no mistaking the identity of the creature called Scylla. Circe's careful description of it could only be misinterpreted at a time when the existence of giant squids was denied. In speaking of Scylla, Circe says:

. . . but her form is a sight portentous that no one
E'er would gladly behold, not even a god if he met her
Round her a dozen of feet she is always waving suspended
Six long sinuous necks outstretching before her and each one
Beareth a head terrific with teeth in a threefold order
Many and thickly arrayed, where gapes death's cavernous blackness.
Up to the midmost part she is hid in the depth of the cavern
Whilst from her lair in the fearful abyss six heads she extendeth
Hunting for fish at the foot of the rock and peering around it,
Dolphins to catch or dogfish, or haply another and greater
Beast . . . (*Odyssey* XII, 96)

It is to be assumed that the Phoenicians experienced an adventure with a gigantic squid about which they told widely and often, possibly with the added purpose to frighten sailors of other nations away from that dangerous spot,—which happened to be on a very lucrative trade route. Needless to say, the description does not satisfy our present-day ideas of zoological accuracy,—an octopus, as the name implies, has eight arms, and a squid ten. But a couple of tentacles more or less would not be a matter of crucial importance in Homer's day, especially to a dismayed sailor. And terrible Scylla, with her dozen feet always waving suspended, could scarcely be other than one of these gigantic invertebrates. The "mythical" animal that has become immortal in literature had "teeth in threefold order," which are surely the lines of sucking disks; and if the locality in question is actually the Strait of Gibraltar it is a section where giant octopuses were encountered again and again from the times of Pliny until recently.

IN EARLY times the huge, tentacle-wielding cuttlefish, or calamary, was often confused with the octopus *(below)*



By LUIS A. SARMIENTO

National Inspector of Secondary Education, Colombia, S. A.

Photos by L. R. Ramos, Courtesy of the Ministry of Education, Colombia

(Above) AN ANCIENT STATUE called "The Sun," which ornaments the square of San Agustín at the headwaters of the mighty Magdalena

THOUGH the ruins of San Agustín lie far in the interior of Colombia, swift modern means of travel enable one to enjoy their peaceful atmosphere of antiquity within four days after leaving New York

(Right) WHATEVER wars may have troubled the ancient people, this warrior now looks out on the placid plaza of San Agustín, in quiet farmland

THE UNKNOWN AGE IN COLOMBIA

One of the most impressive prehistoric sites in the Western Hemisphere holds the mystery of a vanished people, which will be solved when archaeologists fully explore it

It is from the capital city, Bogotá, that we make our excursion to the ancient ruins of San Agustín. At Bogotá we are near the very center of Colombia, the first of the South American countries one reaches coming from the north, just south of the Panama Canal. We are among clouds which bring thunder and hail, 8660 feet above sea level on Colombia's eastern plateau. But the climate is perpetual spring, similar to that of New York in April. It is a static climate. The government is static too, neither revolutions nor unrest.

Round about spreads the country of Colombia, a country that is built up and down, with abundant high mountains and endless lovely plains and woods, the Amazonian forest.

Our trip through this diversified land to the ruins of San Agustín takes two days. Traveling either by automobile or by train toward Girardot on the Magdalena River, we traverse a magnificent landscape, with the vegetation changing every hour as we descend the mountain. First pastures lie on either side, with crops of wheat, potatoes, and maize. Then coffee appears, and finally more plantations but of different kinds, larger and larger ones, with palm trees, cotton, tobacco, and sugar cane.

Traveling westward on this leg of the journey, the

(Below) **A MASSIVE NINE-FOOT HEAD, situated at the foot of a mound near San Agustín where it may have adorned the principal approach to a temple**

FIERCE-LOOKING PAIRS of catlike teeth are characteristic of many of the stone gods of the San Agustín people. The statue above, found at Isnos several miles down the river, has been taken to the city hall; and the head below resides in the plaza

tourist or explorer has faced the snow peaks of Tolima, Santa Isabel, and Ruiz, proud, high peaks of the central range of mountains, where condors dwell. At Girardot on the banks of the Magdalena, he turns sharply southward and ascends the valley of the Magdalena, an amazing river, which is navigable even to this point almost 1000 miles from the Caribbean Sea.

The ancient ruins which are our goal now lie directly ahead of us but far to the south, near the very headwaters of this mighty river. We travel through a charming valley between the eastern and central ranges of mountains, toward the snow shrine of Huila, el Nevado del Huila, from which the state takes its name.

At six in the evening the traveler comes into Neiva and finds the Continental Hotel. (What a big name for a hotel that is—so-so. There are no snakes, no flies nor lizards, but plenty of bad meals.) Happily enough, one can proceed immediately by automobile to the southward. In the gathering dusk we ride through lovely though scarcely visible landscapes, past villages and cottages, up toward the very source of the Magdalena River, toward the Valley of San Agustín and its multifarious stone giants.

I think I am correct in saying that despite the unrest that disturbs many other parts of the world today, you will find the country in which you are

THE CARVED GOD below is apparently in the act of extracting an animal from his mouth: an imposing relic left by the ancient people for future archaeologists, a short distance from San Agustín

traveling most pleasantly friendly to the United States. Colombia has ten million inhabitants and an area equal to that of California, Oregon, Washington, and Montana. Last year in November the National Congress voted a bill authorizing the government of Dr. Eduardo Santos to lend 50 million dollars to build air and maritime bases. By so doing, the Government of Colombia hopes to be able to do its duty in the event that it should be necessary to defend the Panama Canal, vital to all of us. And the North American people can be quite sure of that.

When you realize, as you approach the sleepy town of San Agustín, that it has been possible to reach this remote center of ancient culture in four days from New York City, you will no doubt feel that you have been taken on a magic flight back through time, to be set down in another world. Indeed, the transition is so rapid by clipper plane that many prefer to take the two-week journey by ship, boat, and train which gives opportunity to see a great deal more.

Presently we reach San Agustín, in all its tranquillity. The first person who paid attention to the ruins of San Agustín was Francisco José de Caldas, a man of letters and great knowledge, nicknamed *El Sabio Caldas* ("The Wise Caldas"), a close friend of the celebrated naturalist, Alexander von Humboldt. He was killed by the Spaniards a century and a half ago. He was a patriot and also a scholar; but, as so often happens in many countries to wise men, who love so much to look at the stars without seeing the danger behind them, he allowed the Spaniards to catch him and was shot.

No one, however, paid attention to him in connection with the ruins. Not till more than a century later, only 25 years ago, another man of great intellect, Doctor Preuss, formerly Director of the Ethnological Museum of Berlin, paid a visit of six years to the ruins and wrote a handsome book on them.

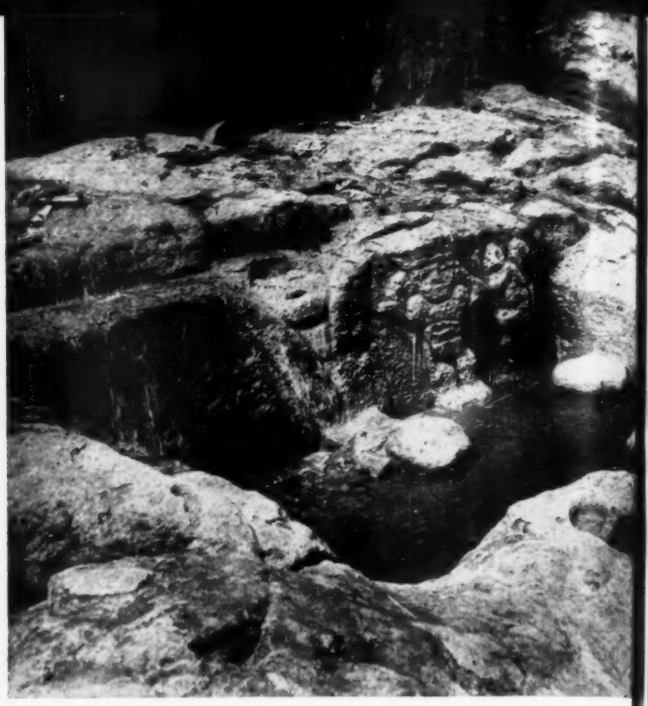
Which brings us to the interesting fact that, unlike most of the other great ruins of the past, those of San Agustín have yet to give up most of their secrets. Preuss himself acknowledged that he could not discover where these sculptures came from nor what other culture may have influenced the artists.

Not being the director of any museum, there is small hope that I may tell more than he did. But this I can say: that you of North America are heartily invited to visit our country and its ruins, you who love our Indian art, our common cultural heritage. The Government of Colombia is now ready to make arrangements for a joint archaeological expedition to San Agustín and the big archaeological sites surrounding the town. There perhaps lies the key to the full knowledge of our prehistoric past.

And now, look, please, at the statues, for in matters of art an impression cannot be conveyed by word alone.

(Below) GODDESS with child in arms: a four-foot statue introducing the feminine element in the art of early Colombia. This was discovered in 1937 by José Pérez de Barradas, Director of the Archaeological Commission

(Below) A STONE EAGLE carrying scepters in its claws, also found in 1937. Further work is expected to reveal much new material shedding light on the position of this culture in the archaeology of South America



(Above) ONE OF THE POOLS of a ceremonial fountain, possibly used for rituals of sexual significance

(Left) A MODERN NATIVE of the region stands beside a statue of a male figure apparently surmounted by the stylistic representation of an animal. With the conspicuous eyeteeth typical of this ancient art, this figure looks out from the eastern bank of the Lavapatas River a few miles back of San Agustín

(Left center) FIGURES decorating the pool of the "Fountain of Lavapatas" shown above

(Left, below) A HUGE CIRCULAR stone bearing the snake-like figure of a sacred animal, or zoomorph

WITH bold and imaginative features, the gigantic deity below surveys a tranquil land whose present inhabitants can give the archaeologist no knowledge of the ancient race that left these imposing monuments

A NAVAHO MAKES SOAP *(99 44/100% Yucca)*

By ALEXANDER AND DOROTHEA LEIGHTON

Photos taken while under grant of the Social Science Research Council

1 Raw material: the broad-leaved yucca plant

2 *(Below)* Soap comes from the root

3 *(Below)* . . . which is peeled

4 . . . and sliced

5 The slices are pounded, then dropped

6 . . . into cold or lukewarm water

7 . . . and churned into suds

8 . . . for a foamy shampoo.

9 But hair must be thoroughly rinsed

10 . . . to avoid scalp irritation.

11 She brushes her hair with dried grass

12 . . . and begins her coiffure like this,

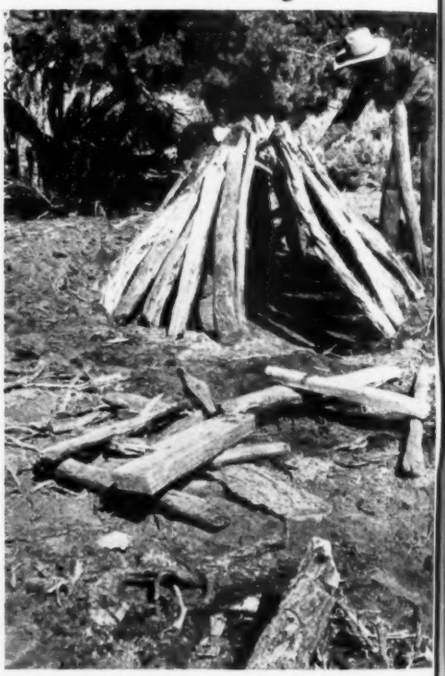
13 . . . folding the hair into a club

14 . . . and tightly knotting it

15 . . . so it is all fixed for 2 or 3 days

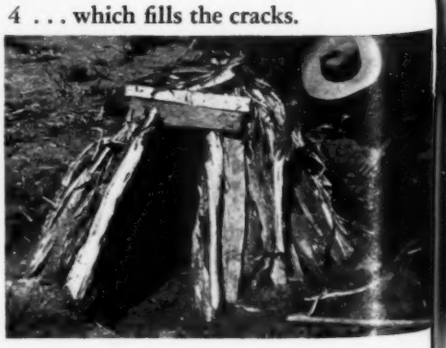
1 He starts with three forked sticks

2 . . . then adds some straight ones.



3 A little boy brings cedar bark

4 . . . which fills the cracks.



A NAVAHO TAKES A "TURKISH BATH"

By ALEXANDER
AND DOROTHEA LEIGHTON

9 The hot stones are put in the hut,

10 . . . and a tarpaulin covers the doorway.

11 Clothes are hung "on a hickory limb."

5 The whole house is covered with dirt

7 . . . and builds a fire

12 And so to bathe—in his own juice.

6 The Navaho digs out the inside

8 . . . in which stones are made very hot.

13 Emerging, he rubs himself with dirt, peels it off, and so is cleaned

GEM FOR JUNE

Two lustrous jewels, the pearl and the moonstone, vie for the delicate honor of symbolizing the month of brides

By FREDERICK H. POUGH

THE official birthstones for June lack the tradition accompanying many of the gems of the month. Neither pearl, nor the alternative stone, moonstone, was used in the Hebrew high priest's breastplate. Pearls are obviously too small and too soft for use in this way; moonstones, which, in a way resemble them in their soft luster, were not known to the peoples of the Mediterranean at that time. We can probably trace the adoption of the pearl as the stone for June to the much more modern tradition which recognizes June as the month for moonlight and brides. The appearance of a pearl makes inevitable an association with the moon—both are round, silvery and softly luminous. Moonstones naturally inspire a similar comparison; their very name arises from the resemblance. But apart from the realm of romantic ideas, the two have little in common.

Pearls are not minerals, for they have an organic origin. They are composed of the same materials as the shell of the oyster which forms them, principally calcium carbonate. Their iridescent luster is the result of the breaking up of light rays by the infinitely thin layers of which the pearl is composed. Starting from a minute irritating granule, the animal deposits layer after layer of pearl substance over the central nucleus, gradually building up the size of the pearl. The process does not stop with the formation of a small pearl, but is continued throughout the life of the oyster, clam, mussel, or snail making the pearl, and the pearl grows ever bigger. Pearls are made by many animals—probably any that can secrete a shell can also make a pearl—but few pearls are valuable. The luster of a pearl is the same as that of the inner shell of the animal responsible. If it is the common edible oyster, the pearl will have the negligible luster and beauty of the inside of an oyster shell, and its value will be correspondingly low. Newspaper stories to the contrary, notwithstanding, the pearls of our edible clams and oysters are practically worthless.

Engraved moonstone from Ceylon

In many parts of the world, however, there is a variety of oyster which is said not to be very good eating but which produces a beautiful lustrous shell, and this is the oyster in which our precious pearls are found. Their slight variations, according to where they are found, enable the expert to tell the origin of any pearl by the nuances of color and luster. Pearls of the Persian Gulf and of the South Sea Islands are the most valuable today. The Japanese natural pearl industry has been wiped out by the much securer system of the artificial cultivation of pearls; man's introduction of a good-sized irritating nucleus has supplanted the natural introduction of small ones. From such large beginnings the oyster is spared many years of work. Often today a few thin layers suffice for the cheaper culture pearl necklaces, but these layers will wear away almost as quickly as they were applied.

Pearls have been highly valued for many years, and a favorite myth tells of dissolving pearls in wine or vinegar to make a precious drink. Cleopatra is supposed to have drunk such a draught, made during a banquet for Mark Antony. But if the pearl were really dissolved before the meal grew very cold, the fluid must have been a potent drink which, we fear, no lady could down. Pearls can be dissolved however, even in weak acid; they are soft and are easily worn away. Few pearls from graves have any luster remaining, because the minute crystals of the thin layers have re-formed in larger sizes, and the delicate sheen is thus lost.

The Romans believed that pearls were solidified drops of dew which fell into the oysters, presumably at low tide. Hindus thought that pearls came from many animals, the most and best from oysters, of course. The Chinese still believe in the medicinal properties of the pearl, and many small and badly formed pearls are used in this way. The Arabians and Persians use pearls as cures for insanity and for various diseases.

All other gems are sold by carat weights —one carat is 200 milligrams, five carats equal one gram. Pearls alone are sold on another system, by grains. Four grains weigh the equivalent of one carat. Values vary according to color, shape, and perfection, and with the larger pearls, as with other unusual gems, it is a matter of an individual price for something unique.

Moonstone, the alternative stone for June, is a variety of feldspar, one of the common rock-making minerals, but in an unusual form. This gem is colorless to slightly milky, and it possesses a remarkable bluish sheen, which is enhanced in a convexly cut stone. Most moonstones come from Ceylon. They are regarded as sacred in India and are always displayed upon a yellow cloth, a sacred color. They are highly prized as a gift for lovers and are thought to arouse love and give lovers the power to foresee their future fortune. Perhaps the moonstone is appropriate as the birthstone for June after all, even without the rhyme the English language supplies.

Exquisitely carved pearl shell from Japan

AMNH photos by Coles

GEM FOR JULY

Assistant Curator, Geology and Mineralogy, The American Museum of Natural History

The blood-red ruby, costliest jewel of all, has derived its virile attributes from the symbolical color of Mars

UNBELIEVABLE though it may sound at first, the rich deep red of July's stone is caused by the same impurity that gives the emerald its brilliant green. Although this impurity, chromium oxide, is unessential to the basic mineral composing either the emerald or the ruby, it is what gives both gems their color and value. In a sense, therefore, chromium oxide, though common enough itself, is the most valuable commodity in the world when purchased in the form of a ruby. When one considers what a slight amount—little more than a trace—transforms a common mineral, corundum, into one of the rarest of gems (provided, of course, it has the clarity and purity essential to any gem), it would be difficult to put any price on it. Even radium could not approach it in cost.

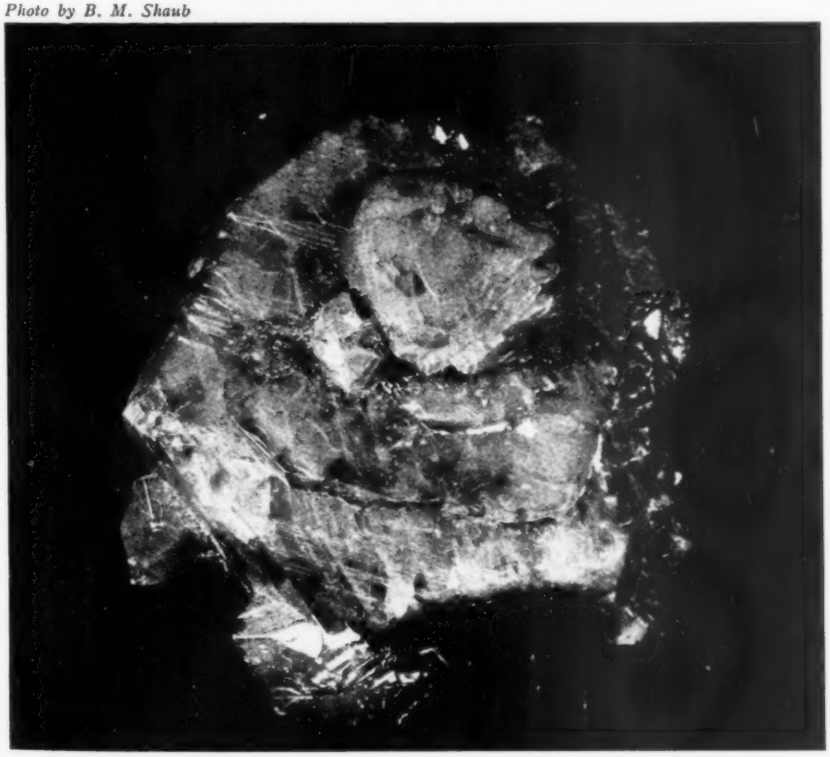
Ruby is one of several corundum gems and is the most valuable and the rarest of all. Fine quality large stones are far rarer than diamonds of equivalent size and quality. Corundum is a common mineral of very simple composition, consisting of aluminum and oxygen,—nothing more. But this compound is the second hardest mineral, exceeded in nature only by the diamond. Corundum is usually gray or brown or greenish or black, and is usually as translucent as a brick. Only rarely do we find it in transparent pieces, and flawless gemmy specimens are even less common. Ruby corundum is the rarest shade, and a large piece of this gorgeous color without a host of imperfections is indeed unusual.

Ruby is found in but few places. The best gems come from Burma, and only these have the bluish-red, "pigeon blood" color. Ceylon rubies tend to be lighter and are less highly valued. The ancients confused various red stones, so that garnets, spinels, and rubies were often thought of interchangeably as rubies. Some of this tendency, if not the ignorance, continues to this day, and we frequently find names like alabandine ruby, Cape ruby, and Arizona ruby applied to garnets. However, the carbuncles of the ancients were often rubies, and many of the legends of carbuncles should probably more properly be applied to rubies than to garnets. Because of their glowing color the myth arose that they contained an internal fire, a fire which could not be quenched nor concealed no matter what cover were placed over it or what cloth wrapped around it. A ruby in water was thought to warm it, eventually bringing it to a boil. Sometimes sex was attributed to gem stones, including rubies, and the darker stones were thought of as being male, the paler ones as female.

In recounting these ancient myths, one would naturally think that so many of the beliefs would be subject to test that they could easily be disproved if anyone took the trouble to try out, for instance, the boiling of water by a ruby. The explanation of their perpetuation lies in several factors, chiefly, the lack of scientific curiosity among the people. If Pliny wrote that something was so, a failure to make it work in a subsequent test was attributed, not to an error on Pliny's part, but to some fault or mistake of the tester. Furthermore, superstitious fear prevented many from trying to summon up the devil, even though they may have thought they had the means to do so within their grasp. Self-styled seers and prophets were willing then, as now, to exploit the gullible, and superstitious peasants were often deceived by tricks. A general lack of knowledge led also to an uncertainty about the nature of materials. If some test failed to work, it might be concluded that the carbuncle in question was not genuine or had perhaps lost its power in some way. All of these factors led to the perpetuation of many ideas which to us seem absurd and obviously fallacious.

A Burmese ruby crystal (in the Harvard Gem Collection)

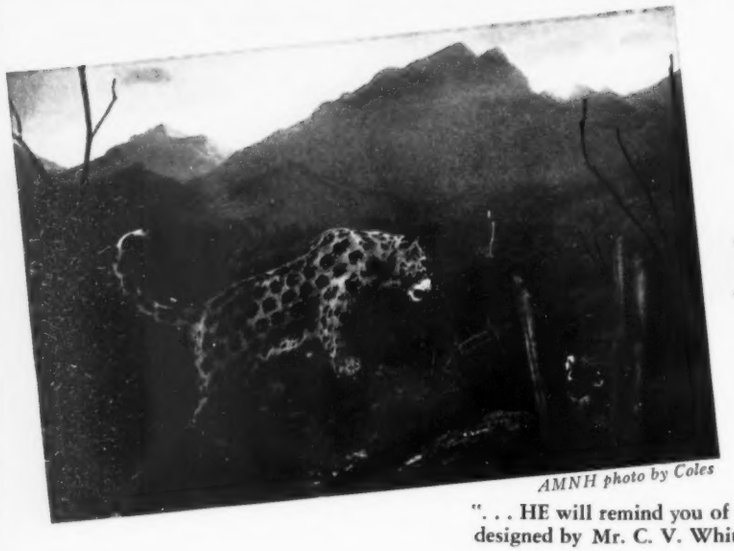
Photo by B. M. Shaub



AMNH photo by Coles

Carved ruby rooster (three times actual size), from Burma

Like many stones, rubies were thought to have the power of foreseeing unhappy events. There are many stories of stones that turned dark upon the approach of ill fortune and became brilliant again when the future promised better things. As with other red stones, an association of ideas made the ruby a stone of curative value for any sort of bleeding. Red was the strongest color, and as such was the color of Mars; on a man it signified command, nobility, lordship, and vengeance. Consequently, it was appropriate as a man's gem. Rubies were thought to have caste: the deeper colors were of the highest caste, but stones, too, could lose both caste and supernatural power by coming in contact with the paler stones of a lower caste. In the older breastplate, ruby was the stone for December, but in modern times it was thought more appropriate for a warmer month; hence, we have ruby as the jeweler's birthstone for July.



AMNH photo by Coles

A JAGUAR FOR THE MUSEUM

By C. V. WHITNEY

Like a mirage in the desert, the elusive "tigre" escaped five expeditions bent on his capture

". . . HE will remind you of summer lightning."—A small scale model of the Jaguar Group, designed by Mr. C. V. Whitney and Dr. James L. Clark for the new North American Hall

FOUR years ago I attended a meeting in the American Museum of Natural History in which President Davison outlined the plans for the new North American Hall, a hall in which the most important and interesting animals of the land would be displayed in their natural settings. It was a magnificent conception, to create within four walls in the heart of New York City an exhibit that would have scenic beauty, as well as educational and scientific interest for thousands of people who would never otherwise see the wonders of our native wildlife.

Since the age of fifteen I had made hunting, camping, and fishing trips over many parts of North America. I have a deep feeling for the marvelous wildernesses of the North American continent, for the variety and grandeur of its scenery, for its different peoples, and for its beautiful wildlife.

President Davison's plans appealed to me immensely, and I undertook the responsibility of providing and donating one exhibit for the new hall, a group portraying the southwestern desert country, with the mountain jaguar, or *tigre,* as its principal subject.

I visited the Southwest first in 1923, going to Arizona and Sonora, Mexico. Every winter since then I have lived in this area, on and around my farm in Sonora, about 300 miles south of the United States border. During this time I made many trips over the surrounding country, and I was completely under the spell of the desert. Why, I shall never know,—for it is a hard and pitiless land,—hot and dry during winter and impassable and unendurable during the summer rains. But its sublime moments are its sunsets and cool nights and the utter lack of a sense of time, the philosophy of mañana.

The people in this land still depend upon wild game and birds and fish to supplement their food supplies. Cattle and farming are their chief industries, so that the wild animals that affect these are important daily topics. Foremost among them is the jaguar *(tigre grande)* who kills their stock. There are other animals in this great southwest desert, deer, peccaries, bear, mountain sheep, antelope, mountain lions, and wildcats. There are many varieties of birds; I have seen the skies black with geese, and long lines of sand hill cranes winging their way to the shores of the Gulf. I have shot seven varieties of duck on a small watering pond for cattle. There are bobwhites, parrots, scorpions, and snakes; butterflies, hummingbirds, and eagles; yet when you are there you are more conscious of dust, flies, and heat than of all the rest.

If you travel to any extent in this country you will hear much about our friend the "tigre." You may see at firsthand the evidences of his depredation. I have seen two full-grown Hereford bulls killed within 100 feet of each other and left lying there with their throats severed, but nothing eaten. If you camp in the country, ranchers may travel as far as 50 miles, having heard by the grapevine that you are there with hunting dogs, to implore you to come and kill the "tigre" who is destroying their live stock.

Occasionally the natives kill a jaguar. They lie in wait near some mountain spring night after night until by luck the beast should come there to drink or kill a deer; or, one of their mongrel dogs will locate a "tigre" too stuffed with food to run or too lazy to be annoyed. But not many are killed in this way.

I made five expeditions to secure a male jaguar for the Museum, but failed. The animal was finally secured three months after my last attempt and at the exact location where I myself had been hunting! On all my hunts, dating from 1929, I was accompanied by Les Wooddell of Nogales, Arizona, a cowboy by profession but a good hand at any outdoor job. You could not wish for a better companion. He will drive you hard but do it with a laugh, and he has a sense of humor, which saves many a situation.

It remained for Les and Miss Mary Ogden Abbott to secure the jaguar three months after my last attempt, and her story follows. He is a fine specimen, and we are not ashamed of him. He lived in the Bacatete mountains, the last stronghold of the Yaqui Indians, and was a legend in the small villages within a radius of 100 miles.

In the exhibit being prepared for him in the North American Hall, you will see him as he was in real life, the monarch of all he surveyed, in the setting of that wild and awe-inspiring country in which he lives. You will admire his muscular display and perfect symmetry; he will remind you of summer lightning.

The Pursuit of OLD JUAN

By MARY OGDEN ABBOTT

With sketches by the author

The hardest kind of riding over cactus and boulders was necessary for a glimpse of this magnificent creature—who soon will be viewed by countless thousands in the full beauty of his natural surroundings in the American Museum

EARLY last January, I received a wire which read, "HAPPY NEW YEAR, EXPECT YOU FEBRUARY FIRST," signed Les Wooddell.

The telegram called my bluff on a series of one-sided jests connected with assisting Les to collect what he calls "a big stud tiger," otherwise known as a jaguar or *Felis onca,* for the American Museum of Natural History.

I replied immediately, asking if he would be seriously inconvenienced if I did not arrive until February 4th. The whole idea continued to retain its charming suggestion of total improbability even after I had engaged a passage on the "sky sleeper."

On Tuesday the 4th of February, half an hour before dawn, I arrived at the airport of Tucson, was met by Les, and proceeded across the Mexican border to his new ranch in the Yaqui reservation, 300 miles south of Nogales.

Ever since a year before, Les had been hunting the *tigre* who, from then on, we knew as "Old Juan." The Museum people were getting impatient, writing that everything was ready to finish the jaguar group, except the most important jaguar. Mr. Whitney, who was presenting the group, had suggested offering a reward for a suitable animal.

It is not easy to catch such an animal in the State of Sonora, or anywhere else if you need one badly. They are not plentiful, and the range of the individual animal is wide. He may leave the country entirely; and, like all game, the big ones grow wary and drift farther than the less desirable specimens. In Sonora they are hunted with dogs, chiefly bloodhounds or a cross between a bloodhound and a fox or a coon hound. Not only are the scenting conditions extremely difficult on account of the dry ground and the heat, but water is scarce in that country, and the cactus is everywhere. The brush is thick, and where other things are not so bad there is likely to be a feather grass that gets into the dogs' noses. The dogs must be trained to ignore the numerous deer. Finally, a jaguar is a large and powerful animal and he is more than likely to turn to bay and kill or cripple a whole pack of hounds. This happened to Mr. Whitney's packs on two occasions.

We traveled from Nogales to the ranch in a Chevrolet truck, accumulating supplies, Ramus, the Mexican hunter, Analito, the camp tender, and vari-

"Time and again the dogs tried to straighten out the trail . . ."

"We followed . . . where a mistake meant a caught foot or a broken leg . . ."

ous odds and ends as we went. On arriving in the valley we were treated to a sunset of unparalleled drama, which culminated in a blast furnace effect as the last rays shot skyward against the clouds through a notch in the western Sierra.

On the ranch there were no tracks of Old Juan, so we moved camp and hunted the south end of the valley for five days. Nothing was found but old tracks and disappointment. Strange and picturesque Mexicans and Indians showed up at intervals, camped with us the night, and departed. Captain De Broussio, who lived at Agua Caliente, a small, desolate and dusty military post in the valley, provided us with mounts, hunted with us briefly, and left. He was very amiable, very silent, and a competent horseman.

The nights were brilliant with the great full Mexican moon. The dawns (we always rode at dawn) were beautiful and cold as death. One longed for the sun, knowing that toward noon one would grow to hate it. The grass stood dry to a horse's belly, the cactus stuck in the dogs' feet and hide, the saguaros pointed to the sky, and the thorns, which protect almost every brush, tore at the rider.

All the tracks of "big ones" were old and they all tended toward the mountains on the west. But at last came a report that fresh tracks had been seen near the Agua Verde, over against the Sierra del Gallo to the west.

We moved camp that night to a tree in the center of the dusty expanse that lies inside the fence at Agua Caliente, and at four o'clock the next morning we broke camp. The horses were sent on eight miles west. We followed in the truck escorted by two Yaquis armed to the teeth and shod in sandals.

Shortly after sunrise we started on the serious business of trying to outguess Old Juan—Les, Ramus, and I mounted, and the two Yaquis afoot. We rode through dense, stiff, leafless brush which grew among large loose black stones. A mounted man could disappear in 20 yards. It was bad going and got worse.

We finally emerged in a boulder-filled arroyo, difficult for ponies, but easier for the Yaquis. On the sandy places Les and Ramus pointed to signs indicating that Old Juan was in the habit of going up and down here, but he had not passed recently.

The morning wore on, the dogs found no scent, and the ponies picked their way over and among the boulders. There is a special name for that black boulder country, but it was easy to make up other ones.

At last we came to some pools of water in the arroyo; the water looked like pea soup. The dogs swam about in it with relish, and the horses drank. Les discussed the situation in his expressive Spanish, which is nothing but an agreeable sound to me.

At noon we stopped by a charming pool of clear water with a grassy place near by. A duck flew up from it. I produced the lunch, which consisted of a handful of raisins all around and a small piece of cheese.

No sooner had I dismounted than the dogs began to "bawl" on a track of something in the brush. We mounted and followed them as they made a loop up the hillside. Time and again the dogs tried to straighten out the trail, but could not. Finally Les called them off, saying he would rest them and let them try again.

We dismounted and sat about, ate our raisins, and

"The rocks slid under Les' pony, he threw up his arm to keep his balance, caught my eye and grinned . . ."

waited. After about an hour the dogs tried again, but they could not take the trail out of the arroyo. After this was certain, we proceeded along the arroyo and stopped again. "No use to trail the dogs back to camp in the heat," said Les. This time when we dismounted I went to sleep with my head on a stone, which made me realize I was tired.

After five o'clock we prepared to start for "home" —the truck. I staggered to my feet and reset my

saddle. No one but me likes that saddle. It was acquired in the bazaar at Athens, and my mother rode it from Hermes, via the Temple of Basse, to Sparta. I believe it was a Russian army saddle. It was embellished with a pair of Army stirrups, from which the brush of Sonora effaced the "U. S." in ten days! I seemed to be the only person below the border who knew how to put it on a horse.

We went out of the arroyo and climbed up a narrow trail onto a "bench," interlaced with more cactus than any stretch I'd seen. Suddenly, on the trail behind us, the dogs picked up a scent. They carried it under the horses, ran it up the trail, checked and turned back, and then turned off into the brush and cactus toward a side hill and the setting sun. They worked it over the bench and through the cactus with only two errors.

Following Les and Ramus, I thought, "If the dogs get the line into the shade it will be all right." Ramus found a track and said something to Les, just what, I was afraid to ask, having decided for myself that this was Old Juan. At the foot of the slope the scent freshened and the cactus was thinner, but the footing worse. The dogs went over the top, and we followed as fast as we could, over boulders where a mistake meant a caught foot and possibly a broken leg for our horses.

The brush grew higher and snatched at our bridle reins. We had to fend our faces, dodge, and try to give the ponies as little trouble as possible. My pony was nothing short of miraculous. He was old at the game and never hesitated for his footing or made a mistake. With a mouth ordinarily extremely sensitive. he never threw up his head or faltered when the brush dragged at his rein. He never stepped on a loose stone and would jump a bad place onto a pile of boulders that did not slide.

When we reached the top, the dogs were on the side of another ridge ahead, still going strong. Going down was worse than going up, but I knew that where the other ponies could go mine could go better. The rocks slid under Les' pony, he threw up his arm to keep his balance, caught my eye and grinned. My pony followed him, and no rocks rolled—on down a place where only goats should go, and up a steeper one. When we reached the rim the dogs had the cat at bay in the flat below. The sun was nearer the horizon, and time pressed. Ramus looked for a way down, said something to Les and, rather to my astonishment, turned back from the cliff. Finally he found a way that could not have been steeper and still passable, with loose black stones. I held back for Les to follow him because the dogs and cat had moved again. To my surprise, Les seemed to expect me to go ahead and said as I passed, "Hold on to the trees as you go down, so that if your horse falls you will slide clear." Even Les thought it rough country; he'd asked me twice if I was all right!

When we reached the arroyo at the bottom, the dogs had moved again but were still in hearing. We kicked our ponies into a gallop, and Les started taking down his .30-30.

The awful thought crossed my mind, "Suppose it is only a *little* cat!"

As we approached the sound of the dogs, Ramus pointed to a big tree, and there in the branches against the setting sun was Old Juan. Les dismounted and I after him, determined to see this fabulous animal. Les had vanished in the brush, and of course I got almost in front of him! I heard an angry voice and then a shot; Old Juan lost his footing and fell to a lower crotch. Les fired again and the animal came down. Ramus appeared, and we all embraced one another. The dogs worried the carcass for a little out of politeness, but for them the show was over. Les started to protest that the animal was not very big and only had big feet, but I thought him a perfectly magnificent specimen.

Les and Ramus cleaned the animal, lashed him across Ramus' saddle, and we pulled out for "home." We watered the horses at the Agua Verde, which was luckily near by, and continued.

There was no trail, the brush was thick and the going rough. Ramus' horse carried more than double, for Old Juan weighed over 180 pounds. It was impossible to ride a straight line, for the cactus was thick in patches or the rocks impassable for tired horses. The light was almost gone when we came to a place where the land broke off in rock slides. Ramus said his horse could not manage them. The ground was hardly visible to us. Les kept turning left, trying to get down. He said, "There is a trail somewhere, if I could find it." At last he discovered a passable descent, and within 50 yards we struck the trail!

We had ridden hard about four miles while the dogs were running, and it must have been ten miles more to the truck. The light was gone and the stars were out. I felt that the way would never end, and my horse went sore on the hard road. I let him trail along behind; and when we got in, I was "out" on my feet.

We packed the truck and pulled out for the ranch arriving at one o'clock or later. The hunt was done. The jaguar for the Museum and I were headed for "civilization."

EACH year many New Yorkers, as well as multitudes of people from other parts of this country, journey long distances at considerable expense to view the wonders of the Grand Canyon of the Colorado River, never knowing that within 130 miles of Manhattan there is a canyon about 50 miles long that is comparable to the Grand Canyon in depth, and probably more spectacular in appearance in that it is less than half as wide at the rim. We cannot compare the two in scenic effect. We do not know whether the marvelous coloring of the rocks of the Grand Canyon region is duplicated here or not, for no one has ever seen the canyon! It is a submarine canyon whose rim is 500 feet below the surface of the Atlantic, and whose mouth lies at least 8400 feet deep.

Although the Hudson Submarine Canyon has never been seen, it has been quite accurately mapped during the past decade by the United States Coast and Geodetic Survey. The scale model of it, shown in the accompanying illustrations, has recently been completed in the American Museum of Natural History and is now on exhibition in the Hall of Ocean Life.

The existence of the canyon has been known for only a little more than half a century. It was in 1885 that Captain Lindenkohl of the United States Coast

LOWER NEW YORK

CANYONS UNDER THE SEA

By H. E. VOKES

Assistant Curator of Invertebrate Paleontology, The American Museum of Natural History

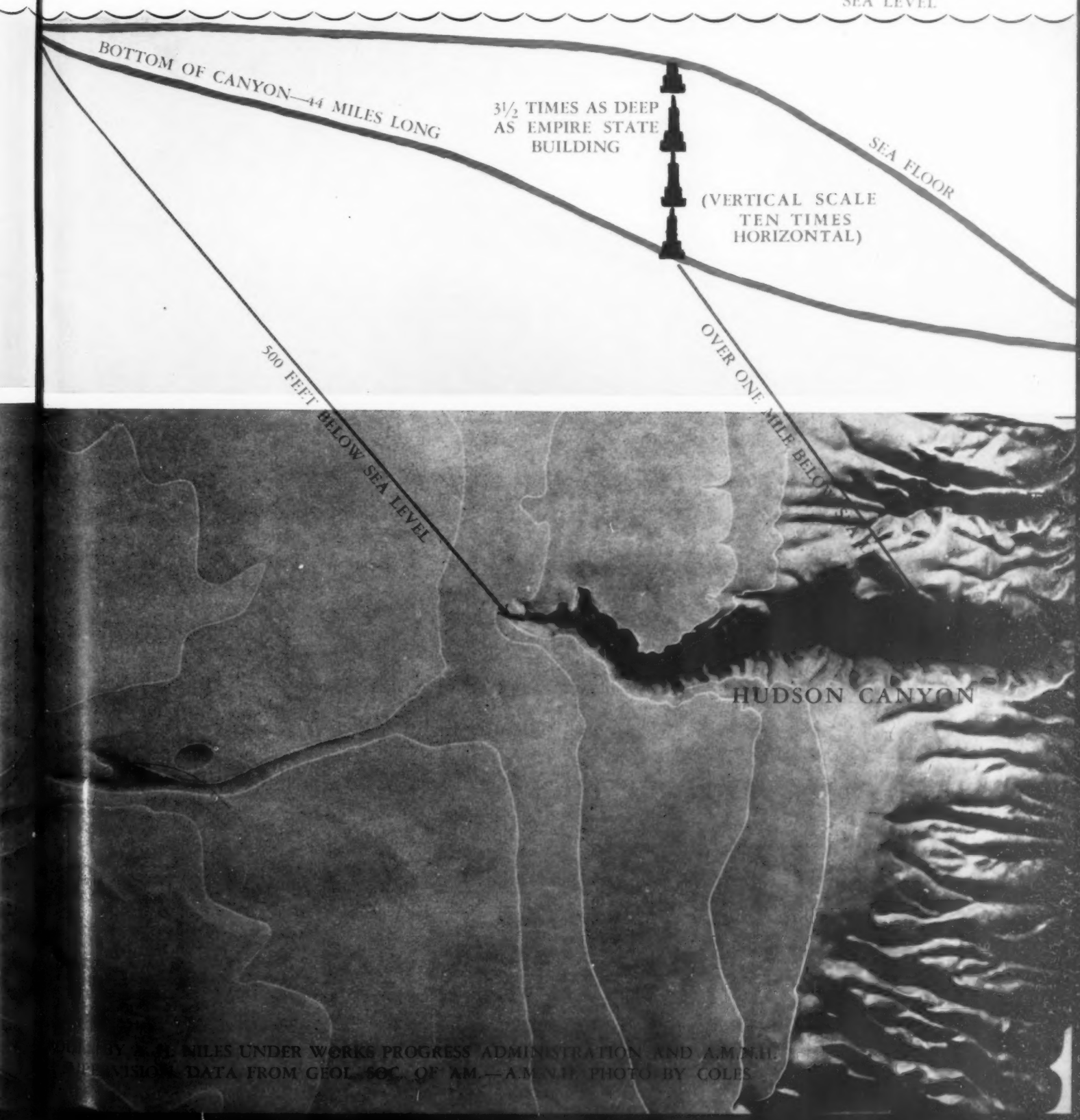
Equal to the Grand Canyon in depth and having more precipitous sides, Hudson Canyon remains one of the great mysteries of the deep, for it represents a strange family of submarine features which no scientific facts can explain

and Geodetic Survey first announced that a *ravine* had been found at the edge of the continental shelf, near the end of the known submarine channel of the Hudson River. Only recently have deep-sea sounding methods demonstrated that such depressions are common features along the margin of the continental shelf and that they possess a depth and length such as to make the term "ravine" hardly appropriate.

HUDSON CANYON BEGINS 30 MILES FROM NEW YORK CITY

On land, canyons are found cut into highland areas, either in mountains or plateaus. Their mouths are always at the lowest part of their course, generally where the highland slopes to join the lowland. They are almost invariably formed by moving water, either that of flowing streams, or by water frozen to form the ice of glaciers.

In the sea, the canyons are found in somewhat similar "terrain," being cut into the margins of the continents where these drop off into the true ocean basins. One is likely to consider that the edge of the continent is where the land dips beneath the sea. Scientists have long recognized, however, that the continents are great uplifted blocks, whose real margins lie some distance out from shore, at a point where the bottom drops off rather abruptly to the true ocean basin. In other words, the surface of the continent passes gradually beneath the surface of the sea



BY [illegible] MILES UNDER WORKS PROGRESS ADMINISTRATION AND A.M.N.H. [illegible] DIVISION. DATA FROM GEOL. SOC. OF AM.—A.M.N.H. PHOTO BY COLES

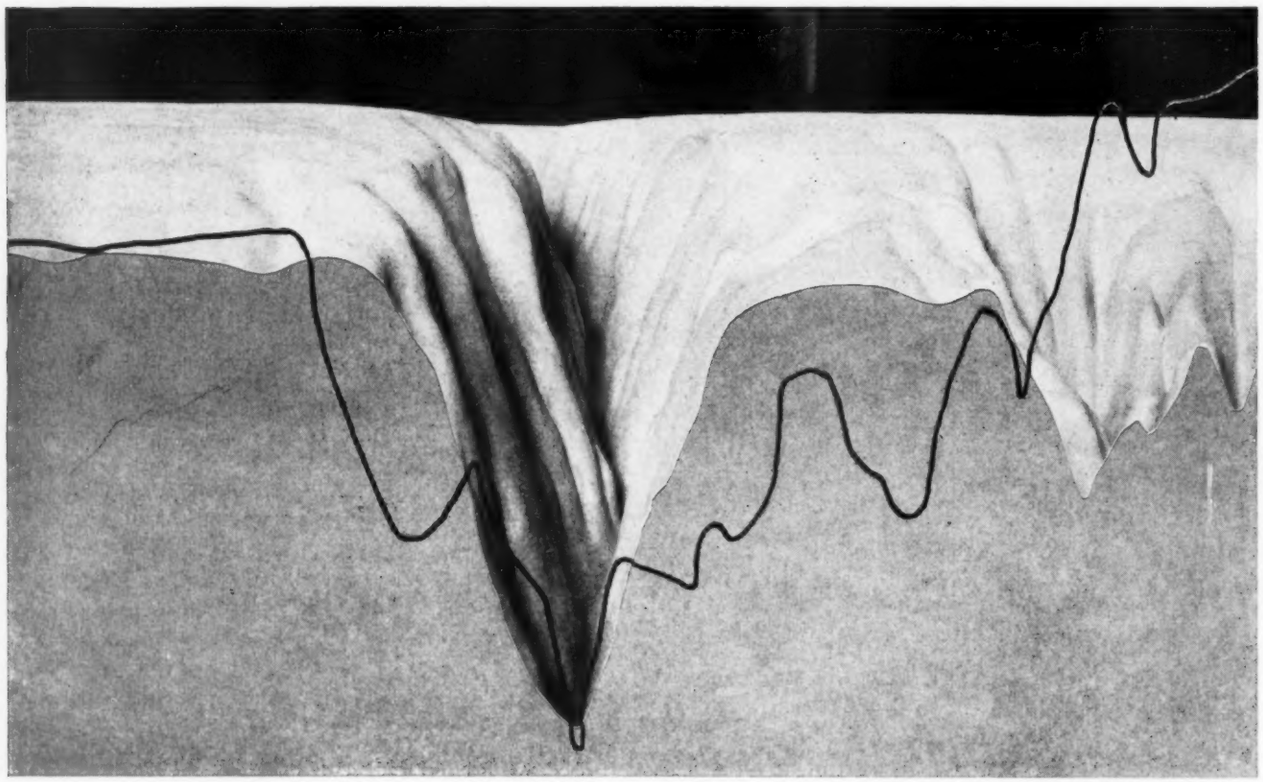
to a depth of approximately 600 feet in most places, at which point a sharper slope occurs. The submerged edges of the continents are referred to as the "continental shelves," and the submarine canyons are all cut into the shelves along their outer edges. The new model, which shows the shape of the margin of the continent in a very graphic manner, is eleven feet long and three and a half feet wide. It represents an area 164 miles long and 53 miles wide and was constructed in the Department of Paleontology with the assistance of the Works Progress Administration, the work being done under the supervision of the writer.

Submarine surveys made during the past few years have indicated the presence of a great many canyons similar to the one shown in the model. At the present time canyons are known to occur off all the edges of the continents save on the Arctic and Antarctic slopes. Their apparent absence is probably due to a lack of adequate surveys in those regions rather than to any considerations having to do with their method of formation.

Many of the canyons occur off the mouths of rivers, those off the Hudson River in North America and the Congo River in Africa being among the most spectacular. Others occur off the Ganges, Indus, Niger, and Columbia Rivers, as well as a multitude of smaller streams. This general alignment led to an early suggestion that the canyons had been cut by these rivers at some time when the continental margins were much higher in relation to the ocean level than they are today. But the recent investigations have shown that there are many gorges that cannot be related to any modern river. One of the more interesting canyons of this type begins almost at the head of the pier at Redondo Beach, California.

When canyons of this sort first became known it was suggested that they might possibly be very old features, perhaps dating even from 200 or 300 million years ago, in the Paleozoic era, and that all evidence of the eroding rivers had been destroyed in the subsequent eras. But within the past five years we have learned that the canyons are cut into rock containing more recent fossils (Cretaceous and Tertiary), and it is now realized that the canyons are young structures, geologically speaking, probably not older than the Pleistocene or glacial period of approximately a million years ago.

The suggestion was then offered that the amount of water frozen to form the glacial icecaps of that period might have lowered the sea sufficiently to permit the rivers to cut the gorges, and that the tilting of the continents under the weight of the glacial ice had so deflected the courses of the rivers across the continental shelf as to permit their cutting the canyons which today cannot be related to any present river course. For example, a large canyon, the Wil-



AMNH photos by Coles

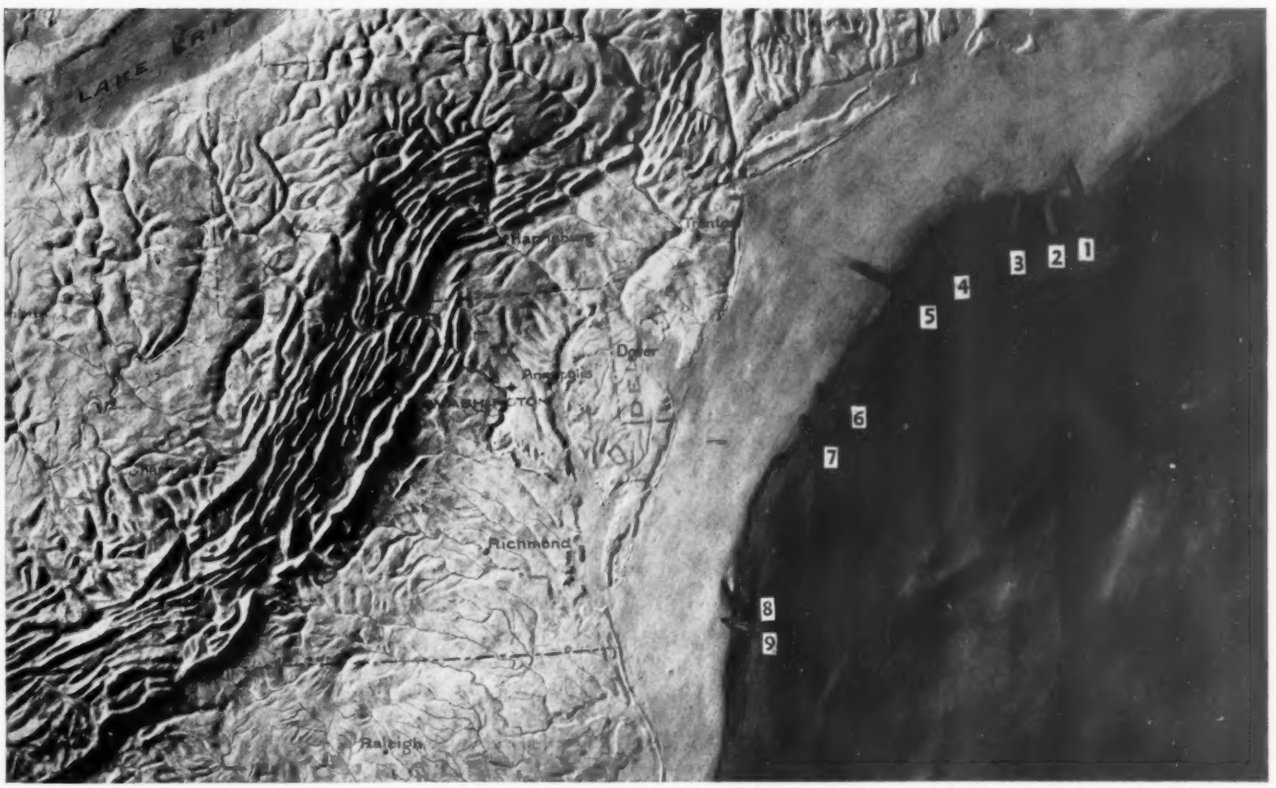
HERE a line representing the cross section of Grand Canyon is placed against the cross section of the model of Hudson Canyon. Note that the canyon 130 miles offshore from New York City has almost the same depth but much steeper sides. (Both profiles show the vertical distances ten times the horizontal)

mington Canyon situated slightly northeast of Cape May, has been attributed to the eroding power of the Hudson River during one of the earlier glacial advances, while the present Hudson Canyon has been attributed to the erosion of this river during the last glacial advance. Numerous careful studies have indicated that the level of the ocean surface was indeed lowered by the water frozen into glacial ice, but all the evidence suggests that such a lowering cannot have been more than 300 feet. This is still some 200 or more feet above the level of the heads of most of the canyons, and no known river today has sufficient current to erode any such structures off its mouth at these depths.

It has been argued that we are misinterpreting the evidence and that the surface of the sea may have been lowered much farther than has been supposed. In answer to this, Professor Shepard of the University of Illinois has pointed out that the valleys extend to a depth of one or more miles and that the removal of enough water from the oceans to permit land at those depths to be cut by rivers would require the storage of about one-half of all the water in all the oceans and the piling up of an icecap at least fifteen miles thick on the continents. This seems impossible and is incompatible with all the evidence.

If the level of the sea was not lowered, perhaps the land itself rose, allowing the canyons to be cut, and then sank back beneath the sea. The amount of up and down movement necessitated by this suggestion is rather staggering to the imagination of the geologist. It would have had to occur along the margins of all the continents, and the amount of uplift would have to have been approximately equal everywhere, and the depression the same. One cannot conceive of such uniformity, geologically; furthermore, it is impossible to believe that such disturbances of the earth's crust could have occurred without leaving their mark on the adjoining lands, and there is no evidence suggesting such gigantic disturbances.

Despite the number of objections which have been raised against the possibility that the gorges were formed by river erosion, a number of students still believe that the true explanation of their origin will be found in this hypothesis. A multitude of other suggestions have been offered to explain the canyons. The recent great increase in our knowledge of their distribution and physical characteristics has shown that many of the earlier suggestions are wholly untenable. There are, however, still some five or six hypotheses which are receiving serious consideration by scientists engaged in the study of them. But there remain so many pertinent and significant objections against the acceptance of any of these that it seems probable that the correct explanation of how these gorges were formed (or are now being formed) has not yet been proposed.



Based on Plate I, Geol. Soc. America, Special Public, No. 7; Veach and Smith: Atlantic Submarine Valleys . . .

As ELSEWHERE along continental shelves, a number of canyons are known to exist off our eastern coast. The canyons shown above are: (1) Hydrographic Canyon, (2) Veach Canyon, (3) Atlantis Canyon, (4) Block Canyon, (5) Hudson Canyon, (6) Wilmington Canyon, (7) Baltimore Canyon, (8) Washington Canyon, (9) Norfolk Canyon

THE RETURN OF A NATIVE

By PAUL KNIGHT
Assistant Professor of Entomology, College of Agriculture, University of Maryland

Regarded by the superstitious as a harbinger of war, the periodical cicada, miscalled seventeen-year locust, is an astonishing, if somewhat destructive, "regular" on Nature's timetable

All photographs taken by the author, near College Park, Maryland

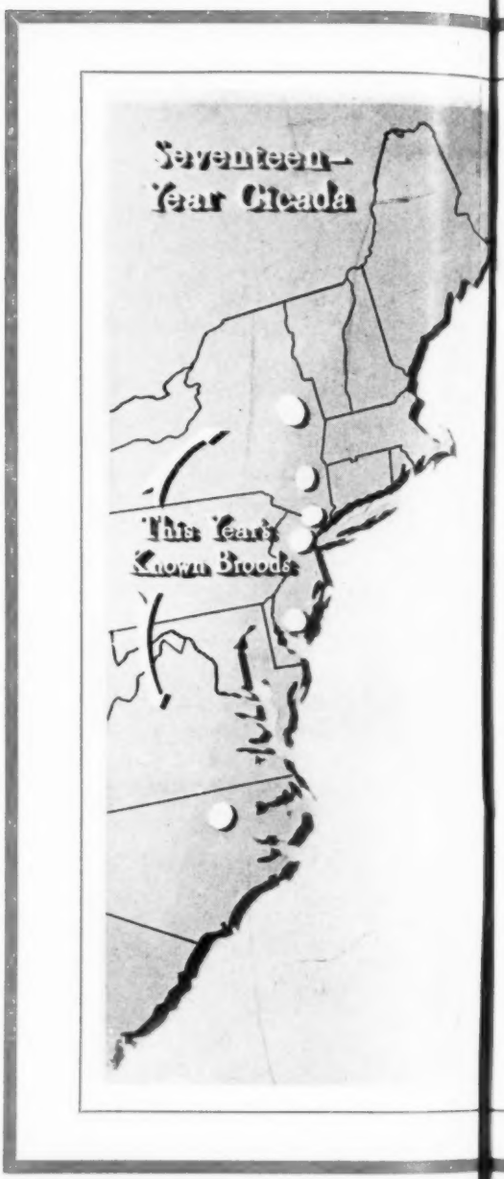
EVERY year during late spring some areas in the eastern half of the United States play host to one of the strangest insects recorded anywhere in the annals of natural history, the ephemeral but noisy periodical cicada. From subterranean caverns where a generation has lived for just a few weeks short of seventeen years it emerges to disturb the quiet of woodlands and towns for a brief interval, then to drop from sight and sound by midsummer. Seventeen seasons later the progeny of this brood will come out of the soil to repeat the behavior processes in the same way as their parents and all the preceding generations.

The periodical cicada, often incorrectly dubbed "seventeen-year locust," was first recorded by white man on this continent in the Massachusetts Bay Colony in the year 1634; and the cicadas that appeared in 1940 in this region were lineal descendants of this historic brood. The cicada was noted in the earliest known work on the natural history of the original colonies a book written by a clergyman who resided in Tidewater, Virginia, before the American Revolution. It was not until the latter part of the nineteenth century, however, that the true nature and longevity, the long periods of quiet between sporadic outbursts, were understood. And today there still remain many unsolved problems regarding the peculiar behavior patterns. Many superstitions have developed out of man's observations on the cicada; and not all of these were originated by primitive tribes. One is especially appropriate this year because it deals with war. Often those who incline to believe in the improbable, point to a distinct letter *W* in the wings as a portent of armed conflict,—in spite of the fact that the insect is always marked thus. War, however, in the light of the past record of human achievement seems a fairly safe prediction, because it seems to occur about as often as "cicada years."

There occurs a brood of the periodical cicada somewhere in eastern United States almost every year, perhaps every year. But in certain seasons the populations of the insect are so small that they may escape notice. Some broods are confined to narrow geographic limits, as is the case for 1941. The impending June invasion, as well as can be told from past records in Government files, will occur in southern and northern New Jersey, in the vicinity of New York City, in the lower and upper Hudson River Valley, and in one location in eastern North Carolina. Readers may be able to add many records to the list already compiled by entomologists interested in this species.

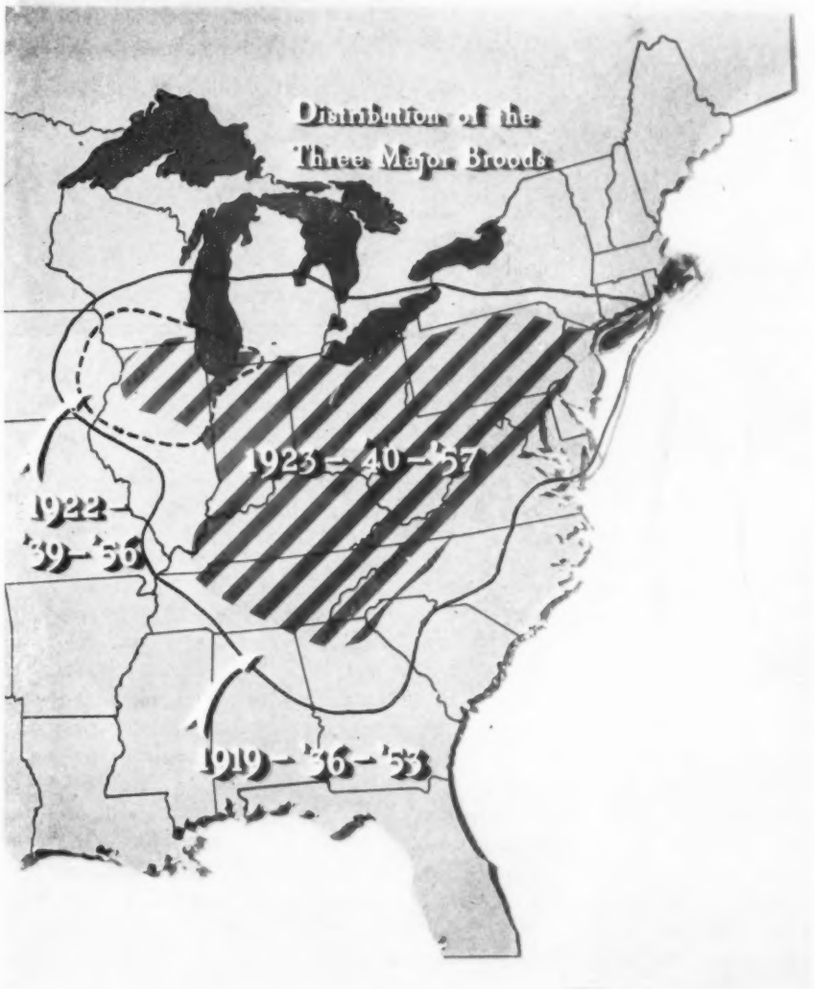
Some broods are very destructive in restricted areas, as for example the one which appeared in northern Illinois and southern Wisconsin in 1939. Several broods cover vast sections of the eastern half of the continent. The largest invasions during recent years occurred in 1936 and 1940. When prevalent, the cicada may cause serious damage to many shade, forest, and fruit trees as well as ornamental shrubs. Some of the oaks are especially susceptible. The writer recently witnessed areas where, after two successive severe swarms, many trees were dying and nearly all those remaining had many dead branches.

Each brood has been given a number



SEVENTEEN and ready to mate and die within the next few weeks. The cicada has emerged from the ground and anchored its claws in the bark of a tree for the transformation

THE MAP at left shows the known areas where this amazing insect is preparing this month, after seventeen years of life underground, to make its appearance for the few short weeks of sunshine that Nature allows it. Many other regions will probably also see the cicada this year, and readers can help scientists plot the distribution seventeen years hence



THE DISTRIBUTIONS of the three major broods according to the years in which they appear is shown at right. The largest and most injurious of all of them is represented by the outside line and is known as Brood X. Similar in distribution but more circumscribed is Brood XIV, indicated by stripes. The dash line indicates the restricted but severe Brood XIII

SHEDDING ITS ARMOR. The split along the back, which began in the preceding picture, has widened in the first stages of the disrobement that will result in a winged insect

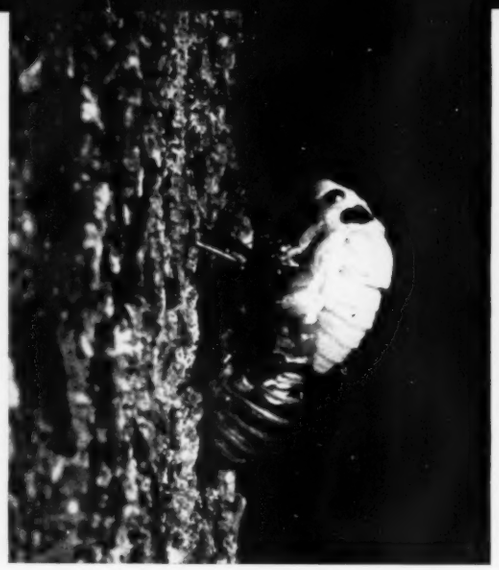
A SNOW-WHITE ANIMAL is revealed within the dark brown casing as the split widens. The transformation requires one or two hours, but cold will retard or stop the process

ONCE shedding begins, the skin is not part of the living animal and must be discarded quickly. If the insect has not anchored itself well, it will be deformed or remain imprisoned

corresponding to a definite year, a Roman numeral which has definite meaning in the literature of entomology. Largest of all cicada broods is the one which last occurred in 1936, brood X, due again in 1953. Younger readers will live to see this prediction (if prediction it can be called) come true. The 1941 cicadas belong to brood XV. Many broods overlap in distribution, and so in a given region the insects may appear several times during a seventeen-year interval, but the elapsed time from egg to adult and egg again is always, as far as we know, the same. Of this time the cicada spends about sixteen years and ten months in the ground as an embryonic animal and enjoys adult existence for about one month.

During late winter or early spring the cicadas that will mature in the approaching season start burrowing upward through the earth and come to rest just beneath the surface a few days or sometimes a few weeks before they are to emerge. They may open their tunnel to the air some time before they come out. Often they construct mud turrets similar to those of the crayfish, though this is a variable phenomenon. The almost rhythmic appearance of these insects, starting just after dark and continuing until about midnight, is like something out of Jules Verne or H. G. Wells. Each night for about three weeks the emergence continues in the same manner. The almost mature nymphs emerge awkardly from their caverns and proceed slowly across the ground to a near-by tree, shrub, post, or whatever they can find to climb. Where cicada populations are heavy the movement of the insects across the surface vegetation can be heard distinctly for a considerable distance, and it is impossible to walk across such lawns or woodlands without stepping on them. Long undisturbed places such as shrubbery borders and orchards may have more than 100 cicada nymphs per square foot of soil.

When the nymph leaves its burrow and climbs a tree or shrub, it is still an immature individual, a subterranean animal that must soon discard the structures that have served it so long. Its new equipment must fit it for life in the air and sunlight. This transformation the cicada accomplishes in one or two hours, depending largely upon the warmth of the night. If it is cold, the metamorphic processes are retarded or altogether stopped. The insect climbs up a plant about one or two feet or, if its host is crowded, perhaps as much as ten or fifteen feet, until it finds a suitable resting place for its last coat of mail. It often shifts back and forth and rolls its body around for from ten to 20 minutes in an endeavor to anchor its claws deep into the bark. It must attach itself securely for this final process, for if its hold is broken after the skin begins to open it will end its life a deformed individual or may be completely imprisoned and killed by the drying shell it is trying to cast off. This does happen



THESE VIEWS from the side show how the cicada begins to free itself by drawing upward and outward and humping its back. Head, wings, and legs have here made their appearance. The insect is preparing for the final struggle for freedom

JUST AFTER EMERGING from its armor, the creature often moves about erratically for a short while

THEN it anchors itself firmly again and seems literally to pump fluid and air into its stubby wing pads

THE WING PADS EXPAND as the onlooker watches them. Gradually the creature that has passed almost seven-

SUDDENLY the cicada becomes furiously active. Clawing the air, it grasps the sides of the shell and pulls free

ITS breathing tube linings (visible above as threadlike objects) are pulled out of the holes along the abdomen

to many cicadas, especially if the atmosphere is dry and hot.

So abruptly that its beginning may be missed, the outer skin suddenly parts in a line down the back, first in the thoracic region, then proceeding forward to the head and backward part way down the mid-line of the abdomen, revealing a snow-white animal within a dark brown casing. The moment the skin starts to shed it is no longer part of the living animal and must be discarded quickly. When the fissure has opened wide enough, as the "profile" photographs show, the cicada begins to free itself by humping its back and drawing upward and outward. First the back of the thoracic region comes out, then in rapid succession the head, wings, and legs. The lining of its tracheae or breathing tubes are also cast off.

When the inner animal seems about ready to leave its shell, it suddenly bends back at a sharp angle, almost as if it were going to fall over backward, and often remains in this position for as much as 20 minutes. Sometimes it is very still and at other times its body pulsates and rotates. After remaining in this apparently awkward position for some time, the insect suddenly becomes furiously active. Its legs seem to claw the air, and it bends forward and backward several times; finally, as if by a supreme effort, it pulls itself upward far enough for the legs to clasp the sides of the nymphal shell and pull itself free. After this it often moves around in an erratic manner for a short while, and then it anchors itself again and seems literally to pump fluid and air into its stubby wing pads until at last they become fully expanded organs of flight. The cicada is still snow white, save for its pigmented eyes and two large dark spots in the thoracic region, and it does not take on its characteristic reddish-brown color until the coming of the warmth and sunlight of the following morning.

A few days after the appearance of the first adult cicadas, mating takes place, and woodlands and parks vibrate with the high-pitched din of the males. Strangely enough the females are mute. The sound of the male cicada is a high-pitched whirring sound halfway between a whistle and a siren and quite distinct from the more rasping call of the harvest fly or dog-day cicada which occurs later in the season. It has been aptly described as saying "pha-a-a-a-roh," and those who have heard it are not likely to confuse it with any other woodland sound. Shortly after the orchestral din is in full sway, the females commence to lay eggs. This is accomplished by cutting deep gashes in woody tissues with the ovipositor, the egg-laying equipment of the female, and it is from this that the damage occurs. The eggs hatch in late July and August, and tiny white nymphs wiggle out of the bark and drop to earth, often from great heights, to burrow deep into the soil that will hold them until some warm spring night seventeen years in the future.

teen years underground becomes equipped with flying apparatus for its brief aerial existence

THE CICADA is still snow white, except for its pigmented eyes and two large dark spots back of them

FOR a generation 17 years hence: a female depositing her eggs during her short life in the world we know

BIG FOR HIS DAY

Bone No. 4666 turned out to be the shank of a brand new dinosaur, greatest predator of his time and equal in ferocity to *Tyrannosaurus rex* though he preceded this famous monster by 65 million years

By GRACE ERNESTINE RAY

Two Oklahoma cattlemen went out eight years ago to wrangle some horses that had strayed, and they found something which eventually resulted in the rounding up of a petrified flesh-eating monster that was new to science. Here is the story of that extraordinary roundup which took place under the guidance of Dr. J. W. Stovall, paleontologist.

While squatting by the roadside on their high-heeled cowboy boots and watching the road-working crew on Highway 64, Pard Collins and Truman Tucker suddenly saw things which surpassed their wildest imaginings of what lies below the surface of the ground. A huge curved bone resembling a giant rib about seven feet long and one foot in circumference was turned up by the wide blade of the grader. Mr. Collins shouted, and the driver stopped the machine. The workmen and cattlemen inspected the grim apparition, with the comforting thought that they could not all be experiencing the same hallucination at the same time. They hastily scratched around for more bones and were rewarded with eye-filling discoveries, including fossilized toes about nine inches long. They concluded that they had found the "grave" of some prehistoric animal. They knew it was a *big* discovery from the standpoint of physical size, if nothing else.

Now at that time these ranchmen had not had the advantage of the popular motion picture, *Fantasia,* with its mixture of classical music, art, science, and humor, in which the horrible flesh-eating monster in Stravinski's *Spring* slays and eats a peaceful monster much larger than itself. But these cattlemen read the newspapers regularly so they had at least heard about the prehistoric animals that roamed this region millions of years before the time of the thundering herds of buffalo and the Indian tribes. In fact, Mr. Collins had a habit of wandering through the hills looking for fossils and had previously found several locations, although nothing strikingly important. A typical old-timer of the West, he lifted his ten-gallon hat and scratched his head thoughtfully as the spring breezes played against his brown, wind-bitten face.

"Let's write Stovall—that bone-digger in the University at Norman," he suggested.

"Okay," Mr. Tucker agreed.

In traditional cowboy dialect, these cattlemen did not "savvy" what the bones were, but they were shrewd enough to know they might be rare, and they

(Left) EXCAVATING a new dinosaur, *Saurophagus maximus,* who once roamed the region of Oklahoma's Panhandle and who upsets previous scientific ideas about the antiquity of huge carnivores

(Above) DOCTOR STOVALL, putting the finishing touches on a *Saurophagus* foreclaw. This lethal weapon is even larger than that of *Tyrannosaurus rex,* who came 65 million years later

were public-spirited enough to call in a museum expert instead of taking possession of their discoveries and trying to sell them as mere curios.

Doctor Stovall, with a scientist's curiosity and elation, could not wait for a week end, but placed an assistant in charge of his classes, jumped into his professorial flivver, and chugged out to the Panhandle the very next day. He took with him Mr. L. I. Price, then a student, who is now associated with the Harvard Museum of Zoology. The site of the discovery was near Kenton in Cimarron County, in that narrow strip of Oklahoma which was known as "No-Man's Land" in the Territorial days and was nicknamed the Panhandle because of its shape.

Doctor Stovall arrived quickly enough, and the hastiest inspection indicated presence of dinosaur specimens packed away in the Morrison shale, a rock formation dating from 150 to 120 million years ago and identified with the Jurassic period.

No wonder Doctor Stovall was all keyed up when he hurried back to his classrooms, even though he knew that the removal of the huge remains intact would not be as simple a job as spring plowing or branding a crop of calves. He immediately applied for federal funds from the Works Progress Administration to excavate the site, and his request was granted. A crew was put to work under his supervision. This was in 1934, and the work proceeded through the months.

Never absent from the site for any great length of time, Doctor Stovall was properly thrilled one day when he checked up and found that his colossal bone yard had yielded specimens of four known kinds of dinosaurs, including the gigantic "Thunder Lizard," *Brontosaurus,* of whom readers of NATURAL HISTORY have already read.* Like a massive petrified tree trunk, the femur or "thigh" of the giant lizard was as tall as the tallest six-foot Westerner when they stood it on end beside the Cimarron pit, and the animal was estimated to be 65 feet long. The other three known kinds of dinosaurs found in this pit were the *Ceratosaurus, Camptosaurus,* and *Stegosaurus.*

These WPA employees, contrary to the proverbial saying, wasted no time leaning on their shovels, but

**See also* R. T. Bird, "Thunder in His Footsteps," NATURAL HISTORY, May, 1939, p. 254; "A Dinosaur Walks into the Museum," *ibid.,* February, 1941, p. 74.

their assignment was long and laborious, and they had to be very careful not to chip off any pieces from the fossils found in this mysterious skeleton closet of prehistoric times. Much skill is required to excavate all around and beneath a huge block of rock containing the bones of a monster, make plaster of Paris protections for it, and remove the entire block. Week after week and month after month the project continued. Once it was discontinued for a year, but was begun again. All the bones and bone fragments were numbered, and it later proved that more than 3500 of the bones were identifiable. Apparently all the animals had lived in the region of a swampy lagoon, in a warm, moist climate, and when old age or disease crept upon them, they sought the company of their fellows on the shores of marshy lakes at their favorite feeding grounds. There they died in great numbers, and petrification took place where they lay.

One morning while visiting the site and poking among the excavated specimens, Doctor Stovall found some bones that were not familiar to him. Of course, to a layman it would be hard to find any prehistoric bone that *was* familiar, but the paleontologist seldom sees a vertebrate bone that he does not recognize as an old friend.

"What's this thing?" he asked that morning as he picked up a hefty long shank numbered 4666. He suspected that it did not fit into the skeleton of any known dinosaur. It was heavier and stockier in proportion to its length than any of the familiar brands of old-style dinosaurs already removed from the pit.

"I had no hope at first that this would prove to be a new kind of dinosaur," Doctor Stovall modestly relates. However, a greater surprise was in store for him. As he personally dug around in the pit where the strange bones had been found, he unearthed a wicked-looking claw. He saw that it was the claw of a forefoot or hand about a foot long, much bigger than those of the known flesh-eaters of the Jurassic period. Of course, he knew that the herb-eaters did not have such claws.

He collected all he could find of the unfamiliar bones, but his diligent searches revealed mainly dissociated bones, scattered about among the familiar bones of the known dinosaurs. Fortunately very few of the bones were broken. Still doubtful about the identity of his strange bones, Doctor Stovall shipped them all to Norman, went home, and then began the detailed process of measurement and comparison of the unidentified bones with the bones of dinosaurs already known. The strange bones proved to be the wrong shape and too small for the herb-eating varieties of Jurassic dinosaurs. And they were too large for the hitherto known small carnivores of that period, yet they had the characteristics of the flesh-eater. In size they reminded him of the horrible-looking *Tyrannosaurus rex* of the later Cretaceous period, yet there were very important differences.

More study and research followed, and finally Doctor Stovall knew without doubt that he had discovered a new kind of dinosaur—a genus that no scientist had ever found before! In instances such as this, no christening ceremony is held, but a new creature, even though it is only an inanimate dinosaur, must have a name—one can't simply go on indefinitely calling it "It." So the new dinosaur was named *Saurophagus maximus.*

The significance of this new discovery is that prior to this time it had been supposed that the *big,* tough and ugly flesh-eating dinosaurs appeared on earth much later—about 65 million years after Doctor Stovall's geologic debutante made its appearance in the Jurassic period. Some *smaller* tough and ugly beasts such as *Allosaurus* had already been found in the Jurassic period, but the largest of these was 29 feet long—small when compared with Doctor Stovall's big-clawed dinosaur, which measures 42 feet.

In other words, it is the first dinosaur of its kind found anywhere on earth. Doctor Stovall found the bones of two fairly complete specimens, and they are now being prepared for exhibit in the University of Oklahoma Paleontology Museum at Norman. This is easier said than done, for many weary months are required to clean all extraneous rock from the specimens, without chipping the fossils themselves. Camel's hair brushes are used, although it seems incongruous that such a delicate tool is needed to work on such colossal skeletons.

In what respects does the *Saurophagus* differ from the smaller carnivores of the Jurassic period? In total size, principally, of course, but the hands and arms are much larger, and the arrangement of the metatarsals is less specialized in that they are well separated and have no overlap. In what ways does this large-clawed dinosaur differ from *Tyrannosaurus rex,* the terrible flesh-eater that stalked about as the king animal of prey about 65 million years later in the Cretaceous period? The *Saurophagus* was much more massive in proportion to its height, and it had arms more than twice as long as the *rex,* because it had not evolved as far away from the dinosaurs that walked on four legs. Which one was more terrible, more destructive to contemporaneous animals in his prehistoric wilderness? That question is difficult to answer. Perhaps it is a toss-up. Both dined regularly off the neighbors.

To make more realistic his stack of fossilized bones, Doctor Stovall has reconstructed his idea of the new genus as follows: *Saurophagus,* measuring 42 feet from teeth to tail and boasting a height of 16 feet when standing erect, had a bulk which equaled that of a *small* house, or perhaps Paul Bunyan's bull! And when you imagine an animal as big as a house with sharp front claws eleven inches long and a mouth that opened to a width of four feet, displaying numerous saw-bladed teeth six inches long, you have reason to be glad that your appearance on earth was postponed to the Recent geologic period.

The joints of this dinosaur were close-fitting, indicating an active creature, although a modern lion could probably have run circles around him. Evidently he had the power to leap upon and bring down sluggish herb-eating animals much larger than him-

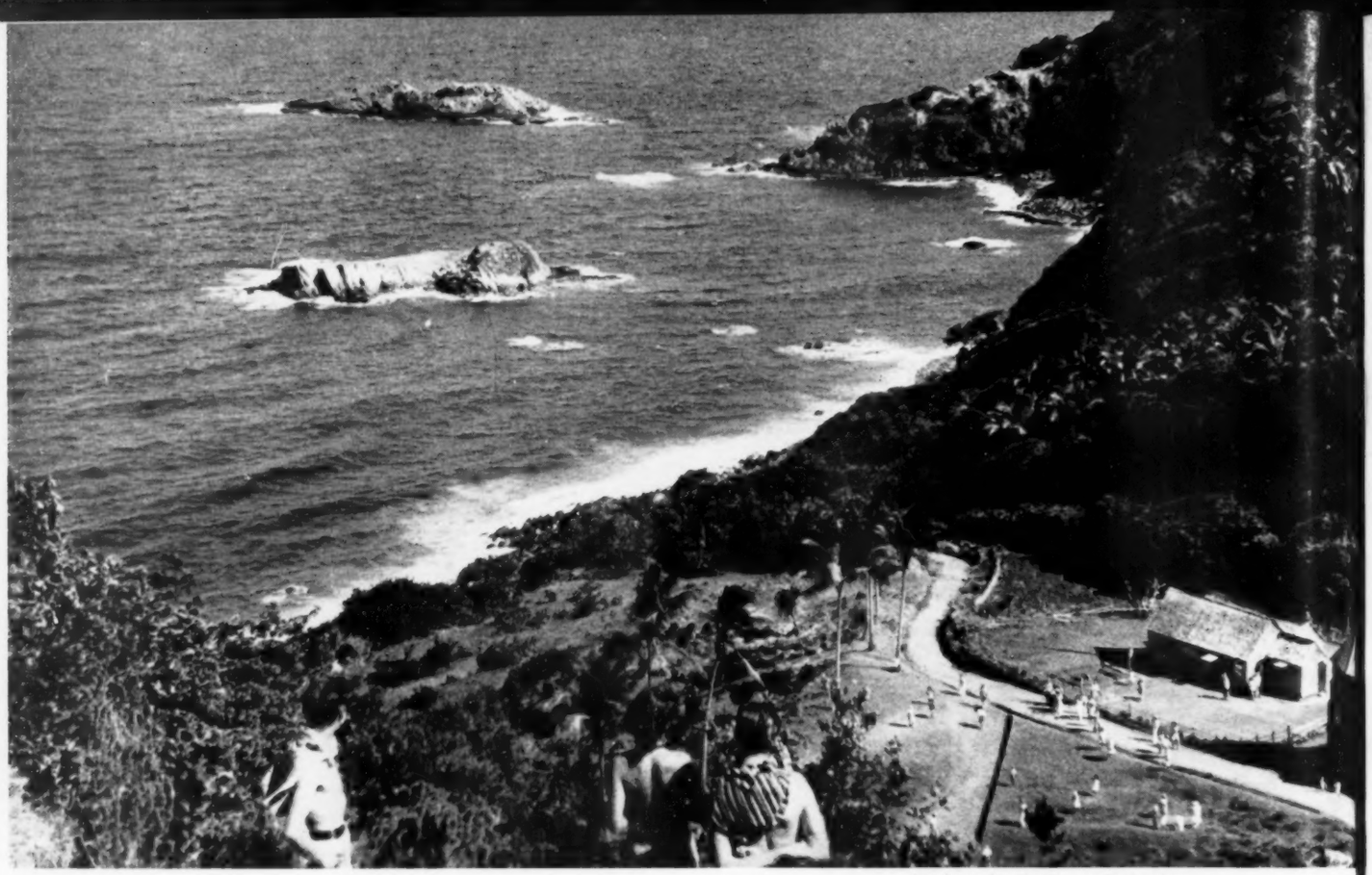
self, although Doctor Stovall personally doubts that his new dinosaur lunched on creatures *almost twice* his size—doubts even that the popular theory that the *Tyrannosaurus rex* performed such feats.

"Any creature, even a silly dinosaur, would use some caution and judgment about picking a fight," Doctor Stovall remarked with a smile.

Despite his strength and power and his technique in terrorizing the enemy, *Saurophagus* would never have been able to pass the medical test of a military draft board, neither would Mrs. *Saurophagus* have qualified as a "perfect 36." They were hopelessly overweight, and it is improbable that any amount of dieting would have remedied the situation. Overactive glands may account for their stupendous size, as in the case of other dinosaurs.

Be that as it may, *Saurophagus'* powerful forelegs and eleven-inch claws distinguish him as the most predaciously developed dinosaur of his day, and it is even possible that, weight for weight, he may have been a more terrible fighter than the celebrated *Tyrannosaurus rex,* who came much later.

Inspecting the pit where *Saurophagus* was found. Preliminary studies reveal its length to have been 42 feet. When standing erect the creature was 16 feet tall, and its mouth opened to a width of four feet



All photos by H. M. and E. L. Ayers

A CARIB COVE: picturesque Salybia Bay on the British island of Dominica in the Lesser Antilles, showing the boulder-strewn strand where fishing boats are beached through rough surf

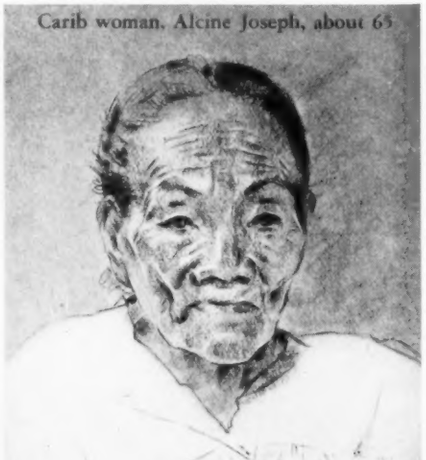
ON Sunday, November 3, 1493, Columbus and his followers made the first landfall, after leaving the Canaries, in their second voyage to the New World. Almost simultaneously, four islands hove into sight. The loftiest he called Dominica, in honor of the day; the others were named for his ship, the *Marie Galante,* for the Spanish monastery, Our Lady of Guadeloupe, and, to mark the attainment of their desired goal, la Desirada.

On the following days, he and his crew made contact with some of the inhabitants—the second group of "American Indians" to become known to history. Those encountered on the first voyage, the Taino of Haiti, had already told Columbus about these warring "Cariphúna" (from which our words Carib and cannibal have been derived), who by advancing through the Lesser Antilles had at that time occupied the most easterly part of their island.

Again it is Sunday, November 3, and now, from the only spot where a single native "Indian" may yet be found in the entire island chain from Florida to the delta of the Orinoco, I am looking out across the timeless Atlantic where Spanish ships were spied just 447 years ago by some long-forgotten ancestor of the men and women around me here today. For there are still Caribs on Dominica,—though they and their Taino foes have long been extinct in the other islands. Here, in the last Carib Reserve, the records of bygone days are enhanced by many living traits. It is not hard to retrace the centuries in imagination and reconstruct a scene we might well have witnessed, had we, as unobtrusive strangers,

Carib boy, Abraham John, 12

Carib woman, Alcine Joseph, about 65



Tina, a Carib girl of 18

COLUMBUS SAW THEM FIRST

They were an energetic race then, and powerful—our words "cannibal" and "canoe" stem from their language—but today the few remaining Carib Indians are a doomed people, soon to add the bones of their culture to the fast mounting heap left in the wake of civilization

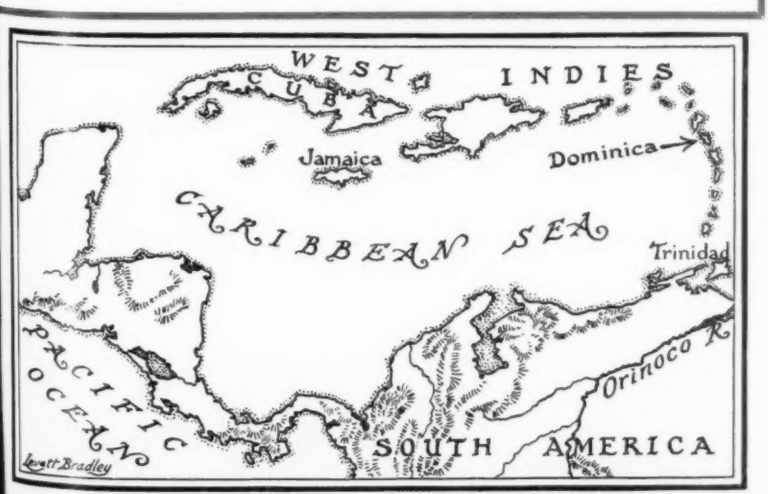
By DOUGLAS TAYLOR
With drawings by HESTER MERWIN

visited this coastal strip in the days before the Conquest.

Then as now, we might have followed a tortuous path worn in the red volcanic clay of a hillside or in the rich black loam of decayed vegetation. On either hand great hardwood trees, whose gnarled roots provide steppingstones in the dank mire or a stairway on steep declivities, rise 100 feet into the moisture-laden air, their evergreen foliage forming a dense screen from the blazing noonday sky. Far overhead in an ungainly flight, parrots whir and scream their Carib name, *"cooriwhek, cooriwhek!"* While from some hidden branch or dark gully the mournful, reiterating notes of a mountain whistler *(Myiadestes* sp.) or the unearthly coo of a native dove put the lone traveler in mind of the spirits of the forest.

There is little else to break the heavy silence. The island's only two native mammals are not in evidence: the *manicou* (a native opossum) is asleep in his nest in the treetops, and the agouti *(Dasyprocta aguti)* is hidden safely from all but a dog's nose. True, we might meet with a hunter advancing

(Below) DOMINICA is the last refuge of the Caribs



"JOLLY JOHN," Chief of the Caribs until his death several weeks ago

(Above) MIMI ETIENNE, a descendant of the Indians who greeted Columbus in 1493. *(Below)* A young Carib whose face typifies his race

stealthily between his curious mute dogs *(áuli),* bow in hand, his naked body of the same color as the dead leaves beneath his feet. And from him, had he unexpectedly chosen to be communicative, we might have learned much of what the forest meant to the men of his race. He might have spoken of bird calls and snares, of the manner of catching young parrots alive by stupefying them with the fumes of burning pimentos, of "honey-trees" where the tiny stingless native bees deposit their aromatic syrup in pockets of black wax. But more likely that native hunter would have sought to instruct us by telling of strange "precautions"—charms practiced on man and dogs and restrictions to be observed before, during, and after the hunt—rules a man must know before he can hope to become a successful hunter.

The Carib has always preferred the danger of the sea or the mystery of the forest to the monotonous labor of planting, weeding, and gathering. Most of such work he has left to the women.

Here and there in our walk we may chance upon the stout bole of a centenarian *gommier (Dacryodes hexandra* Gr.) lying hewn in the graceful form of a dugout canoe between its fired stump and severed head, waiting, amid a heap of chips, to be hauled with gaiety and song to the coast, there to be further shaped and fitted for a new and roving life.

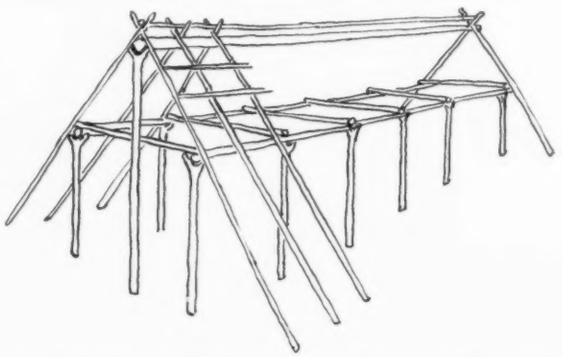
We would find clearings, too, where charred stumps and rotting logs stood out blackly in the yellow sunlight amid a purply green field of manioc. To such clearings, felled and burned by the men, the women came to plant or weed. They trudged back to the coast in the evening, their loads of manioc or sweet potatoes, pumpkin or corn, slung from their foreheads in long, narrow knapsacks of woven palm roots.

Thus the Carib's life was, and largely still is, patterned by three elements: the "high woods," in which game is becoming scarce and difficult to get as the tall trees retreat before the woodsman's ax; the "gardens," which are still cultivated by the primitive system of burning the soil and which must follow the forest inland, leaving behind an impenetrable waste of tangled weeds; and lastly, the sea, which bore the Caribs, like others before and after them, to these shores.

On the last mountain ridge the trade wind hits us full in the face with a refreshing tang of salt and ozone. Two thousand feet below, the Atlantic spreads glitering eastward, and toward the northeast the shadowy trapezoid form of Marie-Galante bars the horizon. In deeply wooded valleys and ravines between the headlands, run clear, crayfish-filled brooks that may, after heavy rain, "come down" as raging and impassable torrents.

Two essential considerations have ever governed the Caribs' choice of a site for their dwellings: the proximity of running water for bathing and drinking; and a view of the sea, their only highway. The Caribs are sailors by tradition as well as by taste, and it is interesting to note that we get our word "canoe" not from the birchbark craft of the Indian but from the Carib *kanawa,* a dugout, whose length —believe it or not—was upward of 60 feet. Its sides were raised by the addition of planks, and it was about eight feet wide in the middle. This 60-foot "canoe" carried two masts, each supporting one sail, and could accommodate 50 or 60 men at the paddles. The other type of dugout used by the old Caribs was, and still is, a smaller craft of similar construction. This *ukuni* or *kuriala* was used for fishing and short journeys. The ones made today vary in length from fifteen to 30 feet, 20 feet being the most usual size.

In the old Carib settlement a central long house, or *tabwi,* built near the mouth of a valley, formed the nucleus of what was usually no more than an extended family group. This building, which attained upward of 24 by 60 feet, served as armory, men's club, and bachelor's residence, and was usually supplemented by a guesthouse of similar construc-



tion but smaller. Two stout forked posts stuck in the ground supported the ridgepole. On either side of these came a row of smaller forks supporting a wall plate that ran the length of the house. Upon the latter rested a series of tiebeams from which the hammocks were slung. Over this framework came the long rafters, which went into the ground and crossed above the ridgepole, where they were held in place by a slighter pole resting above the crossing.

The individual houses, or *mwinã,* rarely measured more than fifteen feet by twelve feet and were of simpler construction. They were dispersed, at the owners' fancy, at various heights on either side of the valley. Each had a courtyard of beaten mud and a surrounding fringe of vegetation where such domestic plants as cotton, calabash, annatto, and herbs of medicinal or magical virtue formed a screen that hid the house and its occupants from the gaze of the indiscreet stranger.

Had we arrived in the evening, when men and women were home from their various occupations, we should have been welcomed by the one whose duty it was to receive strangers. We should have been led to the guesthouse and served with cassava-bread, *túmali* (pepper and manioc-water sauce), sákuti (a manioc beer), and whatever meat or fish, fresh or barbecued, was on hand, set before us on little basketwork tables. We should have drunk out of a half calabash that might have been lacquered and decorated with such designs as cross-hatching, Greek key, diamonds or crosses. We should have sat on long low stools carved out of a single piece of wood. Only when we had finished eating would the Chief and elders come to greet us individually, and in order of precedence. Their greeting would have been a pat on the shoulder and a *"mabwika!"* which has about as much significance as our "how do you do?"

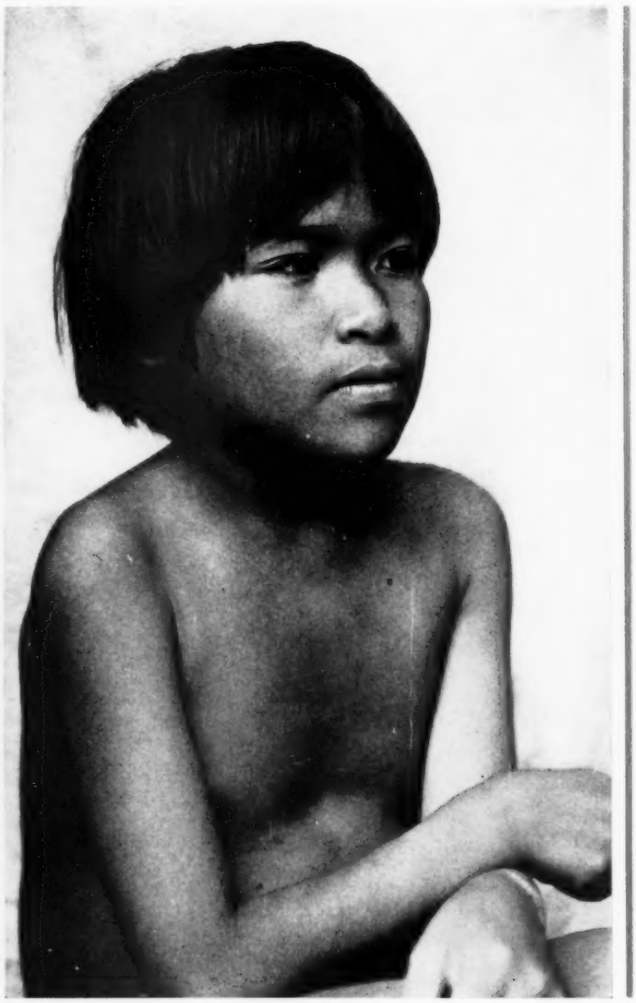
A SCENE showing the vegetation along the coast of Dominica

A CARIB FAMILY before their typical thatched dwelling

A CARIB FAMILY, representative of the only native "Indians" that can be found in the entire island chain from Florida to the Orinoco

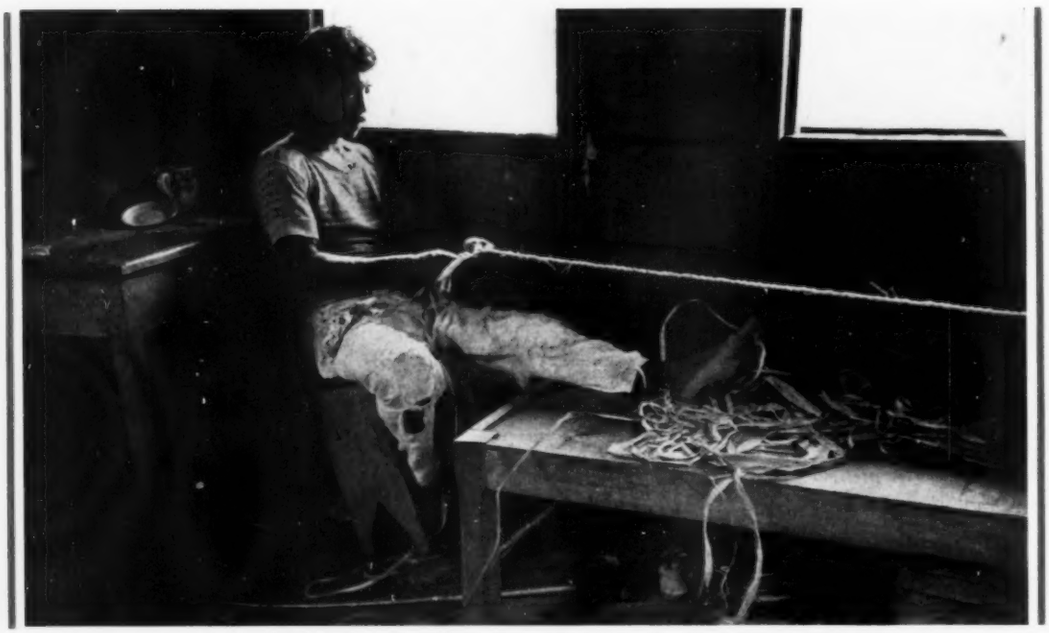
All photos by H. M. and E. L. Ayers

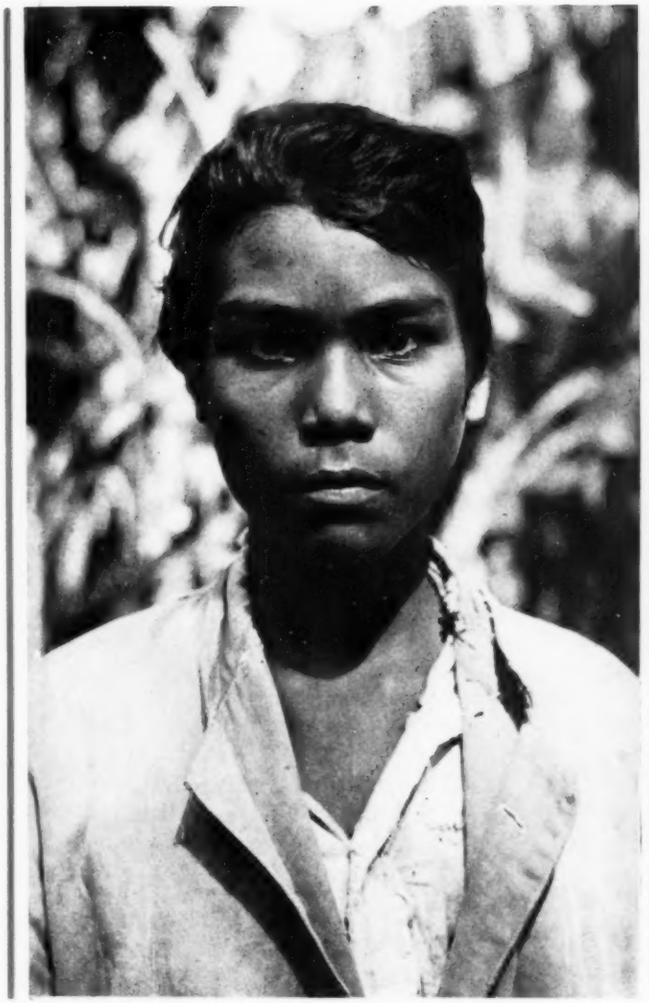
(Left) DOUGLAS TAYLOR, the author, standing between "Jolly John," the chief who recently died, and Jimmy Benjamin



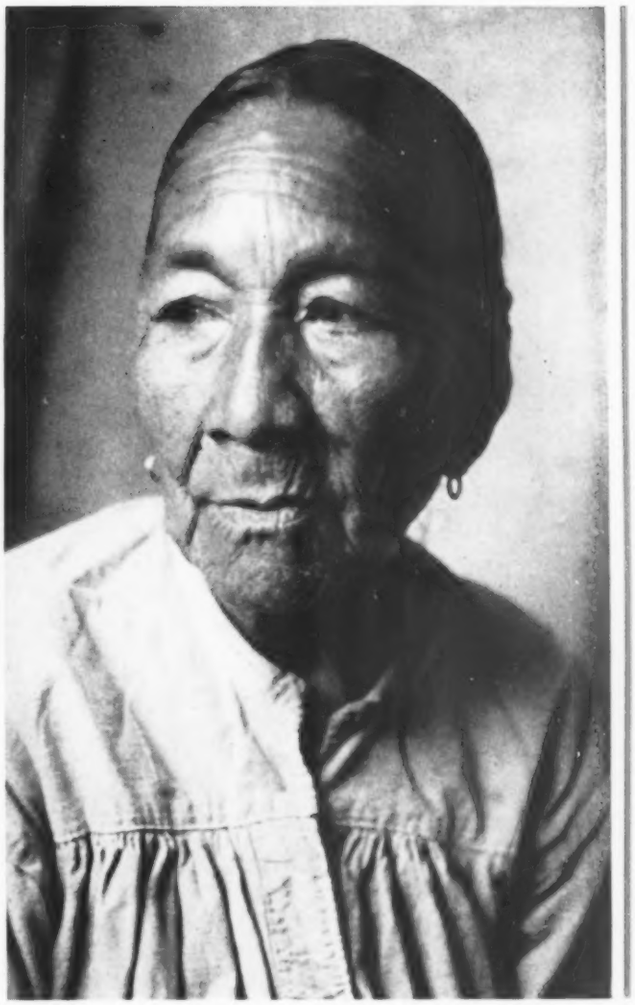
A DUGOUT CANOE, being stretched amidships by water and stones. The Caribs gave us our word "canoe" and distinguished themselves in the building of enormous dugouts 60 feet in length. *(Above)* Abraham John, age 12

(Below) A DEVOTEE of the traditional arts: a native making mahoe sail cordage. The Caribs were one of the few groups who had developed the use of the sail before the coming of white men to the New World





A CARIB YOUTH who, like three out of every four in the last remaining Carib refuge, is of mixed descent



THE OLDER CARIBS decry mixed marriages, but the younger ones feel no compunction. *(Above)* Mimi Etienne

All photos by H. M. and E. L. Ayers

(Below) ELWIN LUCIEN (age 45) and child, seated beside his hut

If we ourselves had arrived from the Guayanas, our hosts' appearance and manners would cause us no surprise. The islanders, like their kindred on the mainland, were mostly sturdy men of rather short, stocky build, with Mongoloid features, straight black hair cut in a fringe across the forehead, and light reddish-tan complexion. Used only to a climate where clothes serve more as adornment than any useful purpose, the Caribs' principle covering consisted of a coat of vermilion paint composed of crabwood oil and annatto, and reputed to prevent sunburn and insect bites.

Two languages in each family

What perhaps would have struck us first was that the men and women did not speak the same language. We would have been told, had we inquired, that the Caribs' forefathers were a branch of the mainland Galibi. Driven from their lands, they had set sail under the leadership of a small though indomitable chief. They had landed in these islands where, after killing the native warriors, they had taken their women to wife. Since that time, their daughters had preserved something of their mothers' tongue.

The Caribs believe that a mother endows her child with its body, while the father's contribution is its spirit. This belief may explain two ancient and widespread American-Indian practices, known as the "couvade" and "cross-cousin marriage." When a man got his first-born son, he took to his hammock, abstained from all food for five days, and thereafter fasted partially for a further period. Even today the young Carib observes certain restrictions intended to safeguard the welfare of his newborn child.

Unless he were a chief, the newly married man went to live in the home of his bride's parents, who, because of the custom known as cross-cousin marriage, were often his own paternal aunt and her husband. Here he passed a sort of probationary period of one or two years, hunting, fishing, and clearing gardens for his father-in-law. His wife followed the usual household routine of fetching wood and water, baking cassava and brewing manioc beer, weaving hammocks, bands and loincloths, and going to the beach to carry home her husband's catch.

After this period, if all went well, they usually made a home of their own. If they should not agree, the man returned to his father's home, while any children remained with their mother.

Although there was a chief in each settlement and one, or sometimes two, supreme chiefs for the island as a whole, their authority was not conspicuous. These chiefs used neither titles nor insignia. They were chosen from among the elders to play the role of paternal arbiter because of superior knowledge or endurance rather than for wealth or family. In wartime, special leaders were chosen to command forces and fleets, and these had to be obeyed throughout the expedition. But in peace, within the family, as within the tribe, commands were practically unknown, and the only sanctions were those of personal or family vendettas.

Usually a quiet, gentle, and easy-going people, the Caribs are given to nursing their wrongs in fits of melancholy and to unreasonable caprice, which under the influence of drink may develop into violent rage. In the old days such was often the origin of murder or even of a war raid. Luckily, these fits were quickly spent. We are told that those prisoners who escaped the first violence of the Caribs' anger were brought home and treated by their captors as their own people. The first missionary fathers to come to Dominica in the seventeenth and eighteenth centuries also relate that the Negro slaves acquired by the Dominica Caribs were much more gently treated than by the run of white masters. In fact, these French fathers —Du Tertre, Rochefort, Breton, Labat—despite their almost total failure to make proselytes, gave the islanders a very good name. Although they deplored their laziness and indifference in matters of religion and acculturation, Breton, who spent 20 years among the Caribs in Dominica (first settled by whites in 1760) declared them to be hospitable, polite, honest, and truthful, adding that "be it said to their glory and to the confusion of Christians, they never behave publicly in an immodest manner."

Few legends have withstood misplaced missionary zeal and the general breaking up of Island Carib culture. What little survives points to a common origin with that of the Guayana tribes. Several tales current in Dominica mention a giant snake that can crow like a cock and in whose head a stone of dazzling brilliance is set. The old Caribs relate how this creature would appear in human shape to their wise men, helping, advising, endowing them with charms, and even on occasion begetting the early progenitors of their nation. One of the latter, Bakámõ by name, had, they say, the body of a snake with a man's head; he was carried out to sea where he became the constellation of that name (our Scorpio). Other stories identify other constellations and heavenly bodies with early culture heroes, but never as objects of worship.

Medicine men

There existed a class of men called *bwayé,* or *piayé,* who, in order to become "wise," submitted to a severe and often painful apprenticeship, which enabled them to fulfill the role of doctor, priest and

sorcerer. They acquired from their masters one or more familiar spirits, which they evoked by incantations and offerings whenever the need for consultation arose. I have spoken to old Caribs who remember such séances. They tell me that offerings of cassava and rum* were placed on tables on one end of the *mwinã,* which was completely darkened. The *bwayé* would sing and mutter, until the spirit "fell in" with a thump. The spirits spoke in strange voices, and "you could not tell what they were saying, but you could hear the 'glou-glou' sound as they drank the rum." When the house was re-opened, the offerings appeared to be intact and were consumed "early in the morning before eating" by those who so desired. The spirits, I was told, consumed "only the soul of the offerings."

Like their kindred in Guayana, the Island Carib still believes that the woods, rivers, and sea are the homes of particular kinds of spirits. On occasion, these may show themselves in a benevolent light, but their appearance is more often of evil omen to man.

Trade

No doubt even before the coming of white men a barter went on between the mainland and the islands. Crescent-shaped ornaments of a gold alloy called *carácuri,* green stone charms, and no doubt certain raw materials and products made of them must have been acquired from the mainland either by war or in exchange for something, perhaps canoes, that the islanders made with greater facility. But all in all, each island and even each settlement in the island was independent of others for their everyday needs. Hardwood was varied and abundant for all purposes, but iron and bronze were unknown, and stone-cutting implements such as axes, adzes, and knives were tedious both to make and to use. For that reason fire was often used to fell a big tree. Nevertheless the Caribs, or their Taino predecessors, used to manufacture by primitive means and through months of labor not only weapons and tools, but also pierced cylindrical beads and carved figures of stone. Whenever possible, the Carib made use of natural objects: thus, his fishhooks were usually a kind of thorn, his arrow points of wood or reed hardened by fire, his scalpel, the pointed tooth of an agouti set in a leg bone of the same animal. Fishbones provided him with needles, necklaces, and boring instruments. The women made some pottery when suitable clay was at hand, and calabashes of all shapes and sizes provided the kitchen with a varied array of buckets, pans and dishes, boxes and bottles.

*Introduced by white men. In earlier years native beers were used.

Meat and fish are roasted directly in the fire, or smoke-dried on a wooden grill over it. The basis of the Carib diet is manioc. Because the tuber of this plant contains a cyanic poison, it has to be rendered harmless by fire before it can be eaten. Without necessarily crediting the Carib with the original discovery, we must marvel that a plant which is poisonous to eat should have been made edible by a process so complex. The tubers are peeled, washed, and then grated into a vessel rather like a small, six-foot dugout canoe. The resulting pulp is next squeezed in a long, stocking-like contraption of close-woven basketry, called *matapi.* Then it is sifted through a basketwork sieve, or *hebichet,* and finally baked on a stone slab either into thick, round cakes of cassava-bread, or by constant stirring, into a coarse meal. The water squeezed out of it soon deposits a fine starch, which may be added to the meal or used separately. As for the remaining manioc water, it can be boiled together with pimento and other seasoning to form what is known to the present-day Creole as pepper pot or cassareep, and to the Carib as *túmali* or *syúti.* After being sufficiently boiled, the manioc water is reduced to a thick brown sauce, which has the quality of preserving any meat cooked in it. For drink, certain thick cassava cakes were formerly chewed by the maidens and spat into a vessel containing water. After a few days' fermentation, this mess was strained and drunk under the name of *ouíku* or *sákuti.*

Apart from their household duties, the women looked after the gardens, collected fruits and berries, made crabwood oil and paint, decorated pots and calabashes, painted the men, spun cotton, and wove hammocks. The hammocks sometimes attained twelve or fourteen feet in width and were closely woven on a simple frame without—according to Breton—either heddles or shed-stick!

Besides hunting, fishing, and clearing land for gardens, the men made dugout canoes, paddles, sails, and fishing line from a species of bromelia, together with the axes and adzes used in their making. They carved war clubs, stools, bowls, and cassava troughs out of red or yellow hardwoods. The same sort of war clubs are used nowadays for killing fish, and are called by the same name, *bútu.* Besides this the men made most of the basketry and other utensils used by the women. It is small wonder that they had but little conception of the passage of time and the value of strange articles.

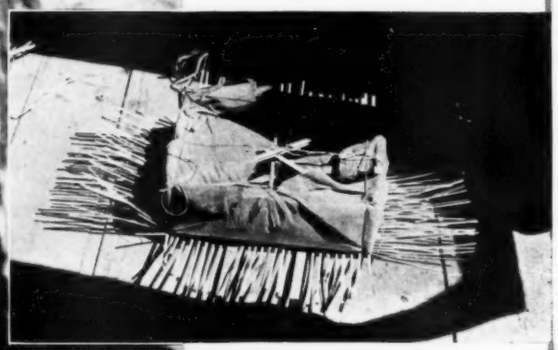
Outside influences on the Carib

Although contacts between Carib and European or Carib and Negro must have been few and far

A NATIVE weaving the outer layer of a waterproof basket

A CLOSE-UP of the weaving shows artistic workmanship

All photos by H. M. and E. L. Ayers



A BANANA LEAF lining goes between the inner and outer basket covering

THE COMPLETED BASKET, fitted with handles, is a useful object of trade

between at first, acculturation began at an early date, as is shown by the "Caribized" words of Spanish origin included in Father Breton's dictionary of 1665. There were at that date Caribized words for horses, cows, pigs, goats, and rats, guns, knives, nails, needles, plates, iron and silver. The words for clothes, hats, shoes, and smallpox had also been adopted into the Carib's idiom, and it seems probable that the things they stood for, despite inborn conservatism, had influenced his culture to some extent.

As long as the Carib had to depend upon his own efforts to produce not only food and housing, but also his tools and weapons, utensils and ornaments, he maintained through tradition and invention a relatively high standard, which doubtless would have improved as time went on. But when he was confronted with the products of a technique far beyond his comprehension and ability, a technique which included guns and steel axes, he naturally abandoned his native crafts, to devote himself more and more to the production of articles for exchange or sale. Unfortunately, most of his products had little value to the Europeans except as curiosities; and so the more he produced, the less he received in exchange. When he was unable to improve his technique,—and this usually was the case—, the Carib could only lower the quality of his work. Moreover, not all of the European products that appealed to the Carib were as useful to him as guns and steel axes. The labor expended for the purchase of clothes, hats, shoes, rum and so on was simply lost, because these things replaced nothing in his old economy. Time hitherto devoted either directly or indirectly to the production of food or comfort was henceforth used, for example, in cutting timber and building canoes to sell to the white man. This process, which is not yet complete, has led on the one hand to a lamentable deforestation, paucity of game, and impoverishment of the soil; and on the other hand, it has led to frequent visits to the town, from which the Carib returns without anything to show for selling his canoe except a sick headache, or at best, some gimcrack and useless product of "the export trade." I had almost reversed the order, and said, "at best a sick headache," for the Indian thoroughly enjoys getting drunk, while the more solid goods hoisted upon him merely delude his misguided vanity.

The retreat before civilization

Innate shyness and conservatism as much as European musketry drove the Carib to the more rugged isles, and in them to the least accessible parts of the windward coast. After the last of their number in St. Vincent had perished in the volcanic eruption of 1902, Dominica remained the red man's sole island of refuge.

By that time, bows, arrows, hammocks, and native pottery were forgotten, and had been replaced (among those who could afford them!) by guns, beds, and cheap crockery; but the Caribs' voluntary isolation, coupled with their paltry commercial value and hard-dying reputation as "dangerous savages," ensured them a relative independence that since then is slowly being broken down by the incursion of Negroes.

It is in the past 40 years that this small group has suffered what is perhaps its greatest loss of integrity—its language, or languages. Doubtless to some extent mutually corrupted, these two idioms subsisted side by side until about the end of the first decade of this century. Both succumbed before the French Creole patois of the West Indian Negro and "colored man." Even today, when their memories of what they laconically term "the language" are jogged, old men and old women of the Reserve still often give different words for the same concept. But with the last Carib speakers there doubtless disapeared many cultural links with the past that never can be replaced. The use of a common idiom leads inevitably to a community of notions and mental attitudes. And so it is that the Island Carib of today knows little about his own culture and nothing about our culture except, as it were, through Negro eyes.

Intermarriage

Although the older Caribs sometimes declare that *"mékeru k'hinsi kasi kámukuru"* (Negroes stink like grass gourds), the younger generation feels no compunction at interbreeding. Out of 400 inhabitants of the Reserve today, 300 are at best, as they themselves admit, *"bâtards Caraïbes"* (half-breed Caribs).

The girls no longer take easily to the old ways, and demand, like their colored sisters, hats, shoes, and sewing machines. The boys learn just enough at school to lose interest in the old pursuits, and far too little to have a chance of success at the new ones. Few are those who still take readily to fishing, and fewer still are those who have any skill or liking for the hunt.

Basket making and canoe building of an inferior quality, together with sawing boards and scantlings, continue chiefly because they are usually the only available means of obtaining the money to buy the products of the colored trader. Many still yearn for a roving life, but it is to the plantations and sugar mills of Guadeloupe, Santo Domingo, and Cuba, or to the oil refineries of Curaçao that they aspire, rather than to the rivers and forests of their Guayana forebears.

HIDE AND SQUEAK!

—if you want to get good animal photographs

By H. H. SHELDON

With photographs by the author

NATURALISTS ARE curious eggs. And there are, in these United States, millions of embryos of curiosity. This expanding curiosity regarding Nature and her ways sends into the wilds its volunteer army, superficially trained in wildlife and woods lore, and armed with every type of camera from miniature to movie.

Curiosity and encyclopedic knowledge of the wilds and its creatures are not enough to capture that universally sought rarity, a good bird or animal portrait. If the amateur naturalist is consistently to bring-'em-back-alive on film, he requires not only time, patience, and no small amount of hard work, but an intimate knowledge of the domestic habits of wild animals and birds, plus something more.

That this "something more" is essential to good animal photographs is immediately apparent when one considers the scarcity of real portraits of domestic animals, which are docile and accessible. Every home has a picture of its own familiar dog or cat or cow or horse. But how many of these photographs of pets possess that quality of telling more than size, shape, and external pattern of the animal? Pictures which portray, in addition, individual characteristics, racial or hereditary instincts, moods, capacities, and vagaries are worth while, and they can be got.

I have been matching human wits against animal craftiness since I was old enough to shoulder my dad's big ten-gauge duck gun, and that is several decades ago. For 20 years my duties as a field naturalist required (among other things) guns, traps, and labels. A camera was something in the nature of a luxury. But from the moment it became my privilege to discard the guns for the camera, I have discovered there is infinitely more satisfaction and glory in shooting an animal with a lens than in stopping a leaping life by a high-powered bullet. Incidentally, I am not a reformer. Hunting is grand sport, providing a temporary freedom and pleasure to unnumbered millions who have come by the urge to track down and kill through the brave blood of hunting ancestors. But I do believe that, with most of us, a saturation point is reached. And when that time comes, the camera ranks as a more potent weapon than the gun, requires a more subtle type of hunting skill, and provides more lasting pleasure. Curiously enough, experience and skill in rifle hunting are fundamental assets in acquiring skill in camera hunting. And of those requirements conducive to that "something more" requisite to animal photography, one of the most important has been brought directly from the sport of hunting with a gun.

(Left) A MULE DEER

This important equipment is in reality a lure. It is used by naturalists the country over to decoy birds and animals within range of either gun or camera. Like most important things, it is so simple as to conceal its own importance from the uninitiated. In the realm of "ologists" it is known as "squeaking": simply a matter of compressing the lips and sucking in at the corner of the mouth. Some of us have perfected it to greater degree than others, not because of anatomical advantages, but by the canny use of imagination.

A naturalist can identify any bird or animal by its song or cry. In addition, he knows which birds and animals prey upon which others. Combining these two sets of facts with a little imagination, he can learn to produce a squeak which will imitate a robin in distress, the squeals of a trapped mouse, or the whimper of a lonesome pup. Cupping the hand at the corner of the mouth controls or amplifies the volume. With a little practice, anyone can become an expert squeaker-upper. Since the day, years ago, when I first beheld this stunt in operation it has been my most potent lure in outsmarting wise old Mother Nature. Deer and hound, hawk and chicken, skunk and house cat —they all fall for it. Birds and animals are as curious as naturalists, and are intrigued by any sounds which do not frighten. I have squeaked the wariest hawks to within a few feet of me, likewise some of the most sensitive and fearful of animals. I have stopped the weasel in his tracks to about-face and sit up like a rabbit almost in my lap; muskrats to turn in midstream and swim right up to my hand; and on the wild deer to pose for me, stamping their feet in exasperation at the sounds of a fake tragedy. I have squeaked the timid ground squirrel from his subterranean haunts to pop up for a three-foot shot; and the badger, like the weasel, becomes a sucker for the squeaks of a rabbit in distress. The handsome skunk is unsuspicious of this sort of lure, and will present his better end for a portrait.

I could go on adding up the times when the squeak has produced salon winners,—but wait. There's a string attached to this squeak. And a literal string, at that! For not all animals are as brazen as the weasel, or as indifferent as the skunk. Nor would a ground squirrel pop up from his burrow if you squeaked him up with camera in hand for a three-foot close-up. But if your camera is set for a three-foot shot, while you and your squeak are hidden behind a bush some 30 feet away, the ground squirrel will be more than apt to surface for a look-see. One did for me. I pulled the string, the shutter clicked, the ground squirrel screamed as he scurried down under faster, it seemed to me, than the 250th of a second at which I shot. But the squeak, string, and shutter were perfectly synchronized, and an interesting photograph was recorded.

At this point those who have not tried it will be tempted to believe a telephoto lens is the thing with which to get good animal portraits. A telephoto lens is a real advantage whenever the subject is in the open for a clear and unobstructed long-range shot. But it cannot see the small, shy animal peering up through high grass, nor the larger animal separated from the camera by thick undergrowth. To catch these, the camera must be near the subject while the photographer and his squeak and string are at a hidden distance.

(Above) **AN INTIMATE MOMENT: mule deer and fawn, taken on Verichrome at 1/100 second and f:6.3**

A little ingenuity is required to invent a gadget to release the camera shutter by means of a string or thread. For one, a Contessa Nettel, I have contrived a brass band that is adjustable and can be slipped onto the camera in a few seconds. To this band is riveted a piece of clock spring, also a two-inch strip of brass, which acts as a trigger to release the spring. The string is attached to the trigger. When ready to use, the cable shutter release is removed from the camera; the band is slipped over the camera so that the spring fits over the shutter plunger; the spring is then pulled up and cocked by the trigger. A pull on the string (I use a level silk fish line) releases the spring, which snaps against the plunger and releases the shutter. This may sound a little like a Rube Goldberg design, but actually it is quite simple. Best of all, it works. I have taken photographs from a blind a distance of 150 feet from the camera, though 30 or 40 feet from the camera is more usually the case. Here again, distance from the camera is largely determined by the temperament of the subject, and by the type of country in which one is hunting.

There is no copyright on this hide and squeak method; but if you use it, I am sure you will get pictures you will want to copyright.

(Below) **A GROUND SQUIRREL at his hole**

One-Man Explorer

Without benefit of base camps and elaborate supply lines, Harry Raven has ventured alone into some of the world's least known jungles. These exploits rank him among the great fieldmen of our time, while his laboratory studies in Comparative Anatomy have brought him international scientific fame

By D. R. BARTON

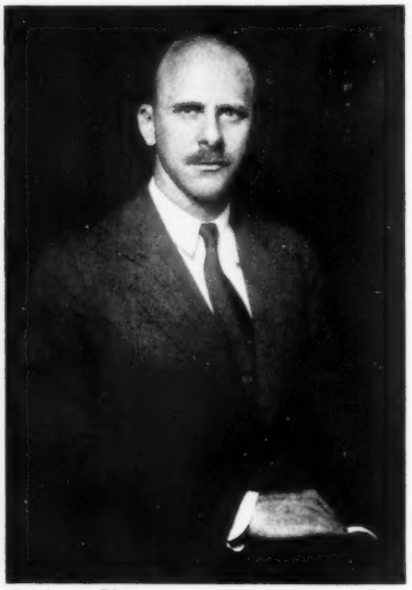
A FEW years ago, visitors lunching in the American Museum restaurant were not infrequently disconcerted by a peculiar grunting sound which seemed to be overtaking them from the rear. Native New Yorkers, inured to the unexpected and accustomed to the cacaphony of metropolitan civilization were perhaps less apprehensive than the sprinkling of celebrated world-travelers. But even New Yorkers turned to stare when the curious sound turned out to be the "hunger cry" of a chimpanzee who entered the restaurant riding a kiddie-car.

Quite the calmest person in the room was the chimp's companion, a mild-mannered, unobtrusive gentleman of medium height whose bald head, close-cropped moustache and conservative dress bespoke a professional man, possibly a family physician, certainly the last type on earth Hollywood would cast as an intrepid explorer. Yet Harry Raven had known what it was to lie near death in the African jungle, leagues from the nearest white man, and he had become, for a time at least and in his own fashion, a wild man of Borneo.

But the chimpanzee held the center of the stage. She rode her kiddie-car on into the curators' end of the dining room, where she was ensconced in a high chair and served two helpings of ice cream. It is generally believed that she was the first ape to be accorded quasi-membership on the Museum's Scientific Staff, though some people regard the matter as controversial. At any rate, the curators were unanimously devoted to "Meshie."

Her foster father, Henry C. Raven of the Department of Comparative Anatomy, had brought her back from Africa and raised her with his own children at Baldwin, Long Island, where she delighted in the seasonal occupations of cycling and sleigh-riding, respectively. Raven probably derived a certain faintly malicious satisfaction from the momentary disruption which her grand entrance *en kiddie-car* never failed to produce, for his earlier experience with museum restaurants had been something of a disappointment.

To forestall any damaging misconceptions, it should be said immediately that he wasn't poisoned. Indeed it was not a matter of gastronomics but of degraded talent (or so it seemed to him at the time). Back in 1907 when the youthful Harry Raven, just out of Bay Shore High School, first applied for work in the Museum, Doctor Bumpus, then Director of the institution, told him that as far as taxidermy was concerned the Museum needed the Paderewskis of the art, not the run of the mill. Bumpus consented, however, to take him on trial. Soon thereafter, Raven's high spirits were considerably deflated when he was assigned the job of making plaster models of the Mitla ruins in Mexico, instead of work concerned more directly with natural history. This was in connection with curious ideas on interior decoration then buzzing in a number of important bonnets. Someone had suggested pre-Columbian ruins as the most appropriate motif for a Museum hostelry, and the machinery of the institution was solemnly set in motion grinding out archaeological facsimiles for the Mitla restaurant, now happily extinct.



Blackstone Photo

HENRY C. RAVEN

Since young Raven had set his heart on being a preparator of animals he found this "building trades" assignment rather distressing. He was, it is true, given several tasks, such as collecting birds on his native Long Island, which were more in line with his aspirations, but as time went on he thought to better his circumstances by following Horace Greeley's historic success formula.

However, he never reached sunny California but obtained work in the Museum at Denver where he collected specimens in the surrounding region with Albert E. Butler, whom he had known at the American Museum. The expedition continued until the fall of 1911, when he returned to New York and not long thereafter received a letter from the Smithsonian Institution in Washington asking if he would like to collect in Borneo. This was more like it. Raven accepted at once and Dr. W. L. Abbott of Philadelphia, whose work he was to take over, suggested a British tramp steamer—that is, if he were looking for "a little excitement."

Raven presently discovered that Doctor Abbott was given to understatement. The freighter's Captain signed him on as ship's surgeon. Purely, Raven supposed, as a formality. His prospects were somewhat clouded, however, before the ship had cleared Sandy Hook. The freighter was alleged to be carrying a "general cargo," but at this point he was rather dismayed to find her taking on 25 tons of dynamite.

It never went off—at least not in Raven's immediate neighborhood—but the crew provided explosives enough. Before they had lost sight of land the first mate sprang a toothache. By chance Raven had a set of dentist's hand pressure drills which a friend in the profession had given him

with the idea that they might come in handy. Raven had signed up for quite a stretch in the East Indies and he inferred that he was being invited to fill his own teeth. So why not practise on the mate? The latter agreed. Raven daubed a little carbolic acid into the cavity and proceeded to attack the more or less anesthetized molar with much gusto and considerable natural skill. He cut away as much of the decayed matter as he could and filled up the cavity with gutta-percha. The mate was so pleased with the results that he refused to consult a professional dentist at any of the ports of call.

This feat established Raven in the eyes of the Chinese crew as a true healer. One night a messenger informed him that one of the stokers was "pretty sick." Raven made his way below with the Captain and found that the stoker had received a nasty bash over the head with a meat axe. It seemed he demanded hot tea from the cook at 3:00 A.M. Raven took a few stitches in the scalp and sealed it over with balsam in the old time seafaring fashion.

Later that same day Raven was standing on the bridge with the Captain when one of the boys came up and said, "Cook, him want medicine."

"Probably killed him," grumbled the Captain.

They found the cook rather badly cut up. He had watched the stoker warily, but the sly fellow hid a mechanic's hammer in the washing bucket, and the moment his erstwhile assailant's back was turned, out came the hammer and down went cookie under a series of savage blows which cut to the bone, though fortunately not through it.

A day or so later, Nature tried her own hand at trouble making and raised a terrific storm. Waves broke over the entire ship, tore away the awnings from the Captain's bridge and forced the crew to throw over considerable cargo. Various repair jobs were undertaken near Gibraltar and on the way to Algiers, but no sooner had they put out to sea again than the ship was waylaid by an Italian warship. Turkey was at that time fighting Italy, and the Italians were looking for a deck cargo of war materials. They sailed alongside, inspected the deck, then signaled the freighter on with best wishes.

In due time, Raven caught his first glimpse of the South Seas and the sight stirred his pulse. It seemed almost beyond belief that the youth who had so lately felt himself in a prosaic rut at the Museum should now be cruising through the fabulous waters of Conrad and Kipling.

South of Suez

To keep the crew occupied, the Captain ordered a rust-chipping bee, passing out hammers and swinging a scaffold over the vessel's side. This monotonous *corvée* under a blazing sun is apt to bring on what the French Legionnaires call *le cafard* (the cockroach: akin to our "bats in the belfry"). Presently one of the sailors went berserk, and while he was apparently calmly at work flaking off rust, he suddenly flung his tool down at the sea and jumped overboard. The freighter slowed and swung about as quickly as the maneuver could be negotiated. Raven, who had bought a pair of binoculars in Algiers, was told to keep the man spotted until a lifeboat could be launched. But the auxiliary craft proved so desiccated that its seams were open and it leaked like the proverbial sieve. Meanwhile the sun-struck sailor was swimming along quite as if he were born to an aqueous medium. Indeed, he was so content with the cooling brine that an oarsman had to bat him over the head before he could be corralled. There was little time to lose, and they barely made the ship before the waters closed over the lifeboat's gunwales.

As the freighter slid into Singapore the smells of coconut oil cooking and of the Chinese quarter in general were everywhere on the soft tropical breeze. Raven thrilled at this first approach to the true Orient. He was now definitely east, not to say south, of Suez and he became convinced that if the worst and the best were all one in these parts, it would be good enough for him.

Before long he went to Java where he obtained all the necessary permits to collect in Borneo, to which island he made his way by another steamer. His mission called for a broad general collection. All manner of birds, mammals and other animals, great and small, were grist for the Smithsonian's mill.

This initial trip into the interior by river boat took but two months of the six years he was ultimately to spend in the East Indies. He lived almost entirely on canned goods for six months until he got the hang of things. Then he began to "go native" for fare, as it were. He bought a 27-foot *perahu* with a huge tree root anchor and rope made out of coconut fiber, for the sails, and in this craft he voyaged for hundreds of miles along the coast of Borneo accompanied by a Chinese boy and two or three Soloks. These tribesmen were outlaws who had once made their livelihood in the Philippine slave trade until the United States armed forces took a hand in these affairs. They felt quite indignant over their extra-legal classification, and Raven had to assure them that his expedition had nothing to do with American policy in the Pacific. He adapted himself readily to their diet and general way of life, and within a few days they were all fast friends.

On shore Raven obviated the problems of overnight camping by simply putting up in native villages along the way whenever these were available. Once he stumbled on a cluster of huts at sundown and asked the affable old head-hunter chief if it would be agreeable to collect some of the animals that abounded in his territory. The chief suddenly frowned. Raven, who has a gift for languages, questioned him further in Malay, trying to find out what the trouble was. It appeared the local potentate was dead set against bringing any striped animals into the village before the rice had grown to be a foot in height. Any other kind was perfectly all right. Raven never batted an eye at this puzzling distinction, while assuring his prospective host that he hadn't the slightest intention of collecting striped animals until the rice was a foot high. The chief brightened instantly, and thereafter all was serene.

During this trip, Raven was the only white man in the whole region. In fact, much of the wilderness he explored was uninhabited even by natives; and many a time he trudged out of the virgin forest onto a perfect Robinson Crusoe ribbon of beach to watch monkeys come down out of the trees at low tide to catch crabs. On moonlight nights he would gather his native helpers, and, armed with fish nets, they picked their way along a chain of magically illumined coral reefs which had probably never before supported the tread of a human foot.

The jungle yielded all kinds of exotic vegetables and greens, and they lived off the land entirely except for rice which they kept stored in the boat together with cured meat and fish smoked over their own campfire

Hunting was hard work in these uncharted, trailless regions, but in time Raven had collected an astonishing

array of creatures — unobtrusive rodents and bats, monkeys, orangutangs, bears, birds—in addition to such spectacular animals as the clouded leopard, which he considers the most beautiful cat of all. Because the country was practically unexplored it was natural that Raven should discover many new species, and he even had one genus of bird (*Coracornis raveni* = Raven's bird) named for him.

Inland

After more than two years wandering in Borneo, he bought a schooner and sailed to the Celebes to continue general collecting on that mountainous island. But here the character of the terrain obliged him to use pack ponies rather than river boats. As in Borneo, his commissary consisted of taking pot luck among the natives, whose cooking was very much to his taste. But here the pickings were sometimes pretty slim. For the first World War was in full swing by this time and the British had cornered most of the rice in that part of the world for their labor conscripts. The repercussions of this act were felt even in the most remote villages. Prices shot skyward and people sold all they had, saving little or nothing for themselves. As a result, Raven's Borneo-trained appetite stood him in good stead. He had learned to enjoy broiled squirrel, at which even the natives turned up their noses, saying it was only a rat with long hair on its tail. He had also devoured turtle eggs, although their whites remain in an absolutely gelatinous condition no matter how long you cook them. And what with one thing and another he was prepared never to flinch at whatever articles of diet fortune provided.

While in the Celebes, Raven took up the habit of chewing betel nut. He was supposed to pick up ethnological material in addition to his zoological collecting. This end of the expedition interested him greatly but he found it very difficult to persuade the natives to part with some of their more sacred talismans and charms. It was their custom, however, to carry suchlike in little bark cloth purses, in which they also kept betel nut and "mixings" (lime secured from burnt sea shells and a rather villainous black tobacco). Raven's chewing was not so much part of his program for going native as it was wily subterfuge. He thereby won the right to borrow a "cud"—the men were always hospitably offering their little purses to him—and he would rummage around, ostensibly selecting a toothsome morsel of betel nut but accidentally-on-purpose coming up with some charm or relic which might be traded for. He got quite as accustomed to the betel nuts as to turtle eggs and although he never exactly relished the taste, he managed to make a good showing without doing any particular injury to his teeth. The natives, of course, gradually rot their own dentition, of which they take very poor care at best. Raven frequently saw them sitting on the ground filing away their teeth with a stone in order to procure a level biting edge. They regarded his own jagged incisors as unmodish "monkey's teeth" and would keep on rasping until they had ground away the enamel and some of the dentine. Raven, needless to say, drew the line at this point. However, he did accidentally take part in one rather harrowing episode which seems to supply proof positive, if any be needed, that practical jokes are seldom worth the candle.

A native girl had offered to open a durian fruit for him, and Raven, as dubious reward for this kindness, decided to play a trick on her, which involved seizing the blade of her knife in a loop of cloth and by a quick flick of the wrists snapping the blade out of her hand. As so often happens, the trick missed fire, and the blade of the knife, instead of flying off at a tangent, missed its aim and struck almost clean through the girl's thumb. Mortified, Raven dressed the wound as best he could and offered to take the girl to a doctor on the coast who, he told her, would cut the member off and sew it over nicely. This proposition did not attract her at all, so he continued to treat the patient himself and after a time found, to his relief and considerable medico-scientific excitement, that there was still circulation in the splinted digit. By careful binding he was able to restore the thumb almost to complete function—a feat of which he felt justifiably proud. He was still a good "ship's surgeon."

As a matter of fact, this surgical skill, like his interest in traps and animals, had been typical of Raven since early school days. During high school he frequently accompanied a veterinary surgeon on his rounds and had performed a number of operations under his direction. Indeed he might well have followed this profession had not his all-absorbing hobby, taxidermy, led him to seek work at the Museum.

However, his interest in animal anatomy had never slackened. Moreover, the skinning and dissecting work on his specimens only served to whet his curiosity concerning the function and evolution of musculature and internal organs throughout the animal kingdom, so that when it came time to leave the East Indies his compass already pointed in the direction of comparative anatomy.

Hollywood Africana

At the outbreak of the first World War, Raven went back to the United States but there seemed little immediate likelihood of America's entering the conflict, so he returned to the East Indies. Then when he got news that America had finally gone in, he tried to get back again but had a very difficult time of it since many Dutch boats had been interned. Arriving by way of Hawaii, he found that he had already been drafted, though by the time he was ready to go to camp the Armistice had been signed and he was left stranded in the midst of civilization.

But Raven was not long for these parts. After a semester at Cornell as a special student in zoology, he took ship* for Africa, again serving the Smithsonian Institution as a general collector. This second expedition was sponsored jointly by the Smithsonian and Carl Laemmle's Universal Pictures Corporation, which had dispatched a lavishly accoutered staff of cameramen, actors, and a director to make "educational" films on the Dark Continent. But to get such pictures, Raven avers, they would have had to use a distinctly different type of men from the ones they took.

Both Raven and Doctor Schantz, a botanical colleague, advised them on photographing game and other natural history subjects, but the Hollywood men had a mind of their own and went off at a rather bizarre tangent which Raven felt would bring them to no good end. He was shocked, though not altogether surprised, to receive a telegram, brought several miles to camp by a native runner, stating that Armstrong, the leader, and Stoll, an actor, had been killed in a railroad accident which took place in a part of the country they might better not have entered in the first place.

After this trip, Raven returned to his original starting point, the American Museum, as a student of Doctor

*The *City of Benares*, recently sunk in the Atlantic while carrying refugees.

William K. Gregory,* then recently appointed Curator of the Department of Comparative Anatomy. It was not long before Raven was assisting him in various projects, among which was the plan for an Australian Hall in the Museum, favored by President Osborn. At Doctor Gregory's insistence Raven was more or less drafted for the proposed expedition, and from that time forward he became Gregory's right-hand man in the laboratory and classroom, as well as chief operator in the field.

Australia

In Australia, Raven found many strange creatures that Gregory had lectured about. He caught flying phalangers by night, and with the help of dogs, curious burrowing marsupials by day. He hunted the Tasmanian devil and trapped the echidna, a queer egg-laying mammal. The unique duck-billed platypus was also entered in his ledger, as were an amazing variety of kangaroos, ranging in size from little "hoppers," at full growth no bigger than rabbits, to giant 200-pounders. Of all the Australian animals, these kangaroos are the most significant from the evolutionary standpoint, though the whole fauna sends Darwinians into transports of joy.

By this time, Raven was prepared to settle down and write a monograph on the entire tribe of kangaroos as object lessons in evolutionary radiation. He succeeded in getting out several articles, one for the *Encyclopædia Britannica,* but after a year or two at the Museum fate contrived to toss still another expeditionary opportunity into his lap. Captain Bob Bartlett was Greenland-bound on the celebrated schooner *Morrissey* and Raven yielded to the temptation of exploring northern latitudes in general and the anatomy of narwhals in particular.

Whales, indeed, virtually flung themselves at him. He had scarcely resumed his magnum opus on the kangaroo when a young sperm whale swam into New York harbor and was killed in Brooklyn's Gowanus Canal, of all places, whence it soon found its way into the Museum. No comparative anatomist could pass up such a boon, and Raven set about dissecting it at once. The huge cadaver was placed in the new but unoccupied Hall of Ocean Life, and there the scalpel work proceeded until the late Doctor Sherwood,

*See "The Evolution of an Evolutionist," by D. R. Barton, NATURAL HISTORY, April, 1941, p. 234.

then Museum Director, threatened to have both Raven and his specimen fired summarily into the street. The operations had been conducted within olfactory range of his office.

Pedagogue

Try as he might to devote some of his time to the material for the proposed Australian Hall, distractions multiplied at such a rate that he could give it little more than a lick and a promise. New York University invited him to lecture for a year, and immediately thereafter Columbia stole him from under its rival's nose to serve as Doctor Gregory's faculty assistant. His dissecting work, always the marvel of his colleagues and his most absorbing interest, was beginning to attract considerable attention. Within the year Johns Hopkins offered him laboratory facilities for the purpose of broadening his knowledge of human anatomy which he felt necessary to a proper study of the apes, a project then looming large in Gregory's program.

1929 found him back in Africa, leading an expedition to collect gorillas for anatomical study at the Museum and Columbia. This proved an extremely difficult assignment and though Raven eventually secured several large males, he failed to bag a single female. But he did not give up without a struggle that very nearly cost him his life.

Plodding deeper and deeper into the less habitable areas of the Cameroon forest, Raven found every effort to secure female gorillas thwarted by the protective habits of these gregarious animals. Whenever he surprised a herd containing the coveted specimens, they would melt silently into the impenetrable foliage while a giant male covered their retreat with reckless charges. Month after month Raven pressed on after these apparent will-o'-the-wisps until a combination of hookworm, malaria, and sleeping sickness "made it a little difficult to do much hunting."

Raven had had malaria in the East Indies and once before in Africa. And when the fever came upon him again he thought he had merely a trifle more severe case. Dosing up with the usual quinine, he let it go at that, ordering his "boys" to set a camp chair for him in a likely clearing. He was too weak to stand but he knew that a half-dead white man is a better shot than these particular natives, and he *did* want those specimens.

Later it was found that what he had was the dread sleeping sickness, contracted from the bite of a tsetse fly. Not that he did much sleeping. Apparently, the chief drawback is that you *can't* sleep. The patient is subjected to a blinding headache which keeps him up all night, allows absolutely no rest, wears away all resistance and reserve fat, and finally through sheer exhaustion produces a coma (the "sleeping" part of it) which may lead to death.

Presently Raven lay delirious on his cot in a native hut with nothing but witch doctors available for 50 miles around. Then came the coma from which he woke suddenly to find a crowd of bug-eyed negroes standing over him. Said one of them, "If this white man not dead today, he be dead tomorrow." Raven was beginning to believe them. He remembered that a funeral every ten days was normal in this locality, and he thought that perhaps it was high time to send for assistance.

He also directed his camp boy to keep the kettle boiling always on the fire and the minute he seemed to be going into a stupor to make him a cup of strong tea. He hoped under this rather mild stimulation to keep alive until the messenger could walk the 50 miles to a Presbyterian Mission station where lived a certain Doctor Lehman. The latter arrived the next afternoon on a motorcycle and hustled Raven onto a conveyance, which transported him to the hospital at the Mission. There, under Lehman's skillful treatment, he partially recuperated and helped the latter in his surgical work. Raven found this experience most helpful in his study of human anatomy.

Actually it was almost a year before he was able to move about with any celerity, and even when it came time to board ship for home he had to spend most of the voyage on the bunk in his cabin, leaving the care of an astonishing traveling companion to a delighted crew.

This companion was the same individual who later startled patrons of the Museum restaurant and who is now immortalized in bronze and oils, not to mention the silver screen. Her name, "Meshie-Mungkut," was bestowed by natives shortly after Raven purchased the young chimpanzee from hunters who had killed the mother. They are Ndjem words meaning "the little swaggerer" or "the bluffer" and it referred to her habit of puffing out her chest and swinging her arms as though she were as big as a mountain. Meshie was not the first of Raven's expeditionary pets. There were black monkeys in the Celebes and another chimp on his first African expedition, whom he had taught to eat with table implements within 24 hours of her capture. But Meshie was far and away the most successful.

Celebrity

While the acrobatic young chimp was ranging spryly over the entire ship, Mrs. Raven anxiously awaited the return of her ailing husband. On the appointed day she went up to Boston to meet the boat, and it was not until then that she had any inkling of Meshie's existence. Raven, lying thin and pallid on his bunk, simply indicated his simian companion and remarked, "Uh, this is Meshie," thereby conveying his intention of adding this muscular and remarkably hirsute primate to his human family. Mrs. Raven, being the wife of so inveterate an explorer, was accustomed to such turns of fancy. Her chief concerns at the moment were his own welfare and the disheartening suspicion that his children, aged four and seven, would not recognize their father. The suspicion was well-founded. A pater familias who spends two years in the malaria-ridden tropics must be prepared to face the consequences. On the other hand, there was the delightful experience of rediscovery, not to mention the joys of establishing Meshie in the family bosom.

The latter undertaking was a huge, even a howling, success. True, during one of her rare sprees, she ripped most of the electric wiring out of the Baldwin house and bent the gas meter away from the cellar wall, but by and large she was highly tractable, quite helpful, in fact. Under close supervision she was delighted to hold the baby and feed it with a spoon, and was the constant playmate of the older children. Mr. Raven has recorded most of her household adventures in previous issues of this periodical.* Both these were written before the amazing lecture tour took place.

Doctor Sherwood, who had objected so strenuously to the Gowanus whale, adopted a far more gracious attitude toward the sweeter-scented Meshie. Indeed, he was so overjoyed by her impromptu performances in the cura-

*See H. C. Raven, "Meshie, the Child of a Chimpanzee," NATURAL HISTORY, March-April, 1932, p. 158; "Further Adventures of Meshie," *ibid.*, November-December, 1933, p. 607.

tor's dining room that he insisted on billing her for a Members' Children's lecture, with Raven as interlocutor.

The "act" went over with a resounding bang and rapidly climbed the ladder from matinée to evening bookings (adult Members' lectures), then soared to the big time circuit in suburban communities around New York.

Meshie toured with Mr. and Mrs. Raven in the family automobile, frequently cranking down the window to extend a hairy arm in the direction of a dumfounded but bravely saluting "Good Humor" man. As soon as the latter had recovered his customary bland composure, he inevitably offered a sample of his wares free of charge. Thus did Meshie outdo her lord and master by contriving to live off the land in the wilds of the U. S. A.

No trouper ever enjoyed success more than Meshie. She became enormously at home on the stage and took all the sittings for movie cameramen, portrait painters, and sculptors, in full stride. Paramount bought her film rights, and "shorts" of her activities have been exhibited on all five continents, to the delectation of the world at large. There is no telling what undreamed-of heights the "act" might have attained, had not the team split up owing to the senior partner's ungovernable wanderlust.

In 1934, Raven had to keep an appointment with Mr. Arthur Vernay to collect in Burma, and so took leave of his family. Nor could he resume the even tenor of his ways at this journey's end. For there were other expeditions in the offing: to New Zealand and Australia with Michael Lerner (1938) and with the same sportsman to South America (1941).

Then, too, there remained the vast clutter of unfinished business in his office and laboratory—the monograph on the kangaroos, the papers on the narwhal and other cetaceans, the monograph on the gross anatomy of the gorilla, the incomplete dissections of the numerous "wet" (pickled) specimens he had brought back from many far-off places.

All this and murder, too. For he has recently been enjoined as an expert witness to identify as human bone fragments, the sad remains of a slain child. Nor was this his first interruption via the law. Not long ago a kangaroo was injured, *mirabile dictu,* in a Minneapolis elevator. The creature was allegedly a "trained" performer who "boxed" professionally with its keeper. This worthy had brought suit on the

Continued on page 61

INFORMATION TEST

A few informational high spots that may be gleaned from this month's NATURAL HISTORY

Correct answers on page 64

1. The Indian boat from which our word "canoe" is derived was 60, 16, or 6 feet long?

2. When you order a clam or oyster cocktail, always look in the shells. They may yield a pearl that will bring you a fortune.
True..... False.....

3. Is there any record of live whales appearing in the middle of New York harbor in recent years?

4. What insect that will make its appearance this June spends only the last 1/200 of its life above the ground?

5. The costliest gem is the
(a) Pearl
(b) Ruby
(c) Diamond

6. What sea "monster" written about nearly 2500 years ago was not generally identified as an actual creature until 70 years ago?

7. There are three gems in a gold ring whose total weight is 240 grains and two carats. One of the gems is a one-carat diamond and another a one-carat ruby. What is the third gem?

8. Burial grounds have yielded archaeologists pearls of great beauty.
True..... False.....

9. Where is there a gorge comparable to the Grand Canyon within 130 miles of Manhattan?

10. The 20-foot statue of Buddha illustrated below disappeared overnight because
(a) It was made of something edible
(b) It was solid gold, and bandits made off with it
(c) An edict demanded the destruction of all figures of Buddha

WHY DID IT DISAPPEAR OVERNIGHT? A remarkable statue of Buddha about 20 feet high, photographed in Chinese Tibet by the well-known explorer and correspondent, Harrison Forman. (For explanation see Answer to Question 10, on page 64)

YOUR NEW BOOKS

A HISTORY OF 8 SCIENCES • ADVENTURE AND JEWELS
NEW HANDBOOK OF THE HEAVENS • ROMANTIC ZOOLOGY
FLIGHT OVER AFRICA • LIVING TREASURE • KUKULCAN

THE ANTARCTIC OCEAN

- - - - - - - - - by Russell Owen

Whittlesey House, $3.00

AS the second in a proposed series on the oceans of the world, this book sets a standard which, if followed by the others, will make that series an important contribution to geographical literature. Geographers may hesitate to accept the author's term, "Antarctic Ocean," as there is no body of water so designated; but it is doubtful whether anyone can read this book without agreeing that the author has reason for his choice of title. As he uses it, the term would apply to those portions of the adjacent oceans where antarctic weather and conditions prevail, probably best delineated by the average limits of drift ice.

Writing with his usual clear and interest-sustaining style, Mr. Owen traces the course of human thought and knowledge of those latitudes from the earliest philosophical discussion concerning the nature of the south polar regions, to the work of the latest expeditions. In doing this, he sticks to his objective, a history of all the recorded voyages in antarctic waters, describing briefly, but adequately, the exploration work done on land. In closing this scholarly and entertaining volume he shows how ridiculous are the various political claims to various portions of the Antarctic continent.

JUNIUS BIRD.

FOCUS ON AFRICA

- - - - by Richard Upjohn Light

American Geographical Society, $5.00

TRAVEL tales from the tropics dwell all too often on physical discomforts, or they rhapsodize on the supposedly limitless resources of the lands traversed. Doctor Light's magnificent volume, on the contrary, presents an expert survey of a vast segment of Africa by a surgeon who is also an aviator and an accomplished geographer. The illustrations consist of 324 photographs, all but 85 of them from the air, and mostly taken by the author's wife, Mary Light, who went along as copilot, photographer and radio operator.

The Lights' air journey of ten weeks took them from the Cape to Cairo and on to Tunis. After zigzagging northward to Lake Nyasa and Zanzibar, they circled over the highest snowy peaks of eastern Africa, and then followed the Nile to the shores of the Mediterranean. Three days on the ground were devoted to the lions of the Serengeti. Their six-place Bellanca monoplane was equipped with every necessary instrument, and operated with rare skill.

Doctor Light's text is far more than a narrative of the flight. It includes most valuable discussions of the geology, history, populations, and economics of the countries along the way. Grass-burning, overgrazing, and soil erosion are serious problems in Africa, as are water supply and tsetse fly control.

The book is divided into nine chapters, mainly on geographic lines, each with its maps and photographs. To me the most exciting views are those of the summits of Kilimanjaro, Mount Kenya, and Ruwenzori. If you prefer animals there are pictures of elephants, lions, antelopes, and other game. Large urban centers, mines, rivers, farm lands, and native villages are all featured.

After Egypt, photography was forbidden for military reasons, and in Corsica the Lights' plane was so badly damaged by a storm that flying had to be abandoned. The closing chapter is on aviation in Africa, and then follows a copious Bibliography. For a vast panorama of eastern Africa throughout its entire length, sharply focussed with pen and camera, one could ask nothing better.

JAMES P. CHAPIN.

LIVING TREASURE

- - - - - - - by Ivan T. Sanderson

Viking, $3.50

THIS volume makes the third of what might be called the "Treasure" series, the other two being *Animal Treasure* and *Caribbean Treasure*. They are all written after the same pattern, and are well-phrased accounts of field studies dealing with a wide range of fauna and flora and spiced with graphic accounts of narrow escapes.

Animal Treasure, the first to appear, gained the author not only a host of readers and some very enthusiastic reviews, but also some severe criticism from experienced field naturalists who believed that the factual structure was unequal to the strain imposed by the heavy demands of journalism. To state the case briefly, no story lost anything in the telling.

In the present book Sanderson is telling of experiences in Jamaica, British Honduras and Yucatan. He finds many interesting creatures, he goes about his work in the field in a methodical manner, and he explores and develops hypotheses for the correlation of fauna and environment. He expounds an ability to predict the appearance of an animal, having seen its environment, or to describe the environment upon looking at an animal brought in by a native. This faculty can be trusted within limits and most naturalists soon observe enough to have the basis for it. It seems to this reviewer, however, that much more refinement is claimed in the Sanderson analysis than can be proved by the very examples he gives.

Sanderson and his associates work at a high tempo, they are enthusiastic, they believe in their mission. In the Introduction the author states that while they take their work seriously they do not take themselves seriously; and this probably is the reason for the rather surprising contrast between the highly journalistic accounts of personal hazards and the serious philosophic passages. The intention to reduce pomposity is commendable but the alternative has its pitfalls as well.

H. E. ANTHONY.

NEW HANDBOOK OF THE HEAVENS

by Hubert J. Bernhard, Dorothy A. Bennett and Hugh S. Rice

Whittlesey House, $2.50

THIS *New Handbook* is an entirely rewritten version of the *Handbook of the Heavens*, written by members of the Junior Astronomy Club of the American Museum of Natural History, and published a few years ago. The original book, although intended for the beginner in astronomy, was highly commended by leading professional astronomers throughout the country, and went through seven printings. The new book is twice as large and, although adapted to beginners, it is much more scientific and exact—particular attention being given to lucidity in the text. It has better star charts, in which all of the objects mentioned in the text are incorporated.

Of great interest to the amateur are the extensive observing lists of double stars, clusters, variable stars, and nebulae. These lists contain the most useful information, in the most complete detail, that this reviewer has ever seen in a book of this kind. In the case of double stars, for example, the following data are given—name of star, location, magnitude, position angle, distance apart, and colors of components; as well as remarks attracting the attention

or curiosity. Pertinent data are also given for star clusters and nebulae, and for variables.

The book includes fascinating chapters on introduction to the heavens, stars around the poles, autumn and winter skies, spring and summer skies, stars of the southern skies, planets, comets, meteors and the sun and moon.

The chapter on the moon has been greatly enlarged, and is the best that we have seen. There is a new chapter on rainbows, auroras, and other wonders. There are precession directions for plotting the paths of planets and invisible objects. Also, there is an improved and highly correct Glossary, as well as Appendices on asteroids, sidereal time, etc.

All in all, the authors are to be congratulated upon an excellent, dependable, and most useful book on astronomy for the observer, and for teachers of astronomy.

CLYDE FISHER.

THE LUNGFISH AND THE UNICORN: An Excursion into Romantic Zoology

- - - - - - - - - - - by Willy Ley

Modern Age, $2.75

DINOSAURS may not be extinct, but penguins are and lungfish should be. With such paradoxes Mr. Ley beguiles the reader into a pleasant sojourn in the borderlands of zoology. For anyone who does not require that romance be amatory, the subjects of this book are really more romantic than those of most novels, and the literary quality meets the standards of fiction writing.

Mr. Ley here finds zoological romance in three broad topics: mythical animals and their possible basis, animals that have become extinct in historical times, and ancient types of animals that have not become extinct. In the first category are unicorns, giants, dragons, basilisks, and sea serpents. This section ends with the remarkable hypothesis that the "sirrush" of ancient Babylon is a dinosaur possibly still surviving in Africa. The recently extinct animals are the usual interesting lot: urus, great auk (the original penguin), ground sloth, dodo, passenger pigeon, etc. Then come the so-called living fossils, in which the recent discovery of *Latimeria*, a living fish of a group thought to have been extinct for some 60,000,000 years, takes its place. Gondwanaland is used as a peg on which to hang discussions of a number of archaic (or in some cases merely rare) animals, some of which have nothing to do with the Gondwana theory.

If the book were not so good, there would be less reason to wish that it were better. Errors of fact and of judgment occur, but these are generally unimportant and it would be quibbling to emphasize them. It is a more serious fault that evidence that might be admissible in a court of law but that is entirely inadmissible in a scientist's study, is insistently accepted by Mr. Ley, who upbraids scientists who do not suffer from the same confusion. The charm and worth of the book remain, but a few grains of salt should be sprinkled over some of its pages.

G. G. SIMPSON.

KUKULCAN, THE BEARDED CONQUEROR

- - - - - - - - - by T. A. Willard

Murray & Gee, Los Angeles, $5.00

THE Maya have fascinated Mr. Willard from his youth and he has taken advantage of a brilliantly successful business career to find out more about them. In this, and several other books, he has shared with others his enthusiasm. In an era when the amateur of the arts and sciences has almost disappeared, Mr. Willard's writing has a very real place. His intense personal interest is fresher than the cold objectivity of the professional scholar or the padded casuistry of the feature writer.

Kukulcan, the Bearded Conqueror is not an academic study of the latest research on the Maya. There are no records of scientific excavation nor bibliographic delving. On the other hand, Mr. Willard tells what interested him and how two early explorers, E. H. Thompson and T. Maler, inspired him with their own almost passionate enthusiasm. Mr. Willard sees the Maya as living people, not as an example of social patterns. His book is for the reader, not the student. I wish that there were more people, like Mr. Willard, who find archaeology interesting as an avocation. *Kukulcan* is a good beginning for those who think archaeology might be entertaining, if it were not for the way in which most archaeological books are so devoid of personalized human interest.

GEORGE C. VAILLANT.

DEVELOPMENT OF THE SCIENCES,

- - - Edited by L. L. Woodruff.

Yale University Press, $3.00

THE history of science in any of its branches is a fascinating subject. It is always interesting to trace the development of our knowledge and understanding in any field. This volume is the second series of public lectures sponsored by the Yale University Chapter of the Gamma Alpha Graduate Scientific Fraternity given during 1939-40. The presentation is not technical but designed for the layman; consequently the publication is for the general reader.

The discussions are by eight well-known members of the faculty of Yale University, and comprise the fields of mathematics, astronomy, chemistry, physics, geology, biology, psychology, and medicine. They are not written in the journalese style of the hack writers who often undertake such tasks, but each is written by a specialist in his field—by one who has the broadest dependable background, impossible in the all-round scientific writer or editor. It is obvious that one person cannot be a master in eight fields.

It is now amusing to read the prophecy of the famous French mathematician, Lagrange (1736-1813) that mathematics as a field of research was nearly exhausted and that "at the universities the chairs of mathematics will sink to the undistinguished level of those, for instance, in Arabic." In times past this feeling has no doubt been shared by workers in other fields. In the nineteenth century, what physicist dreamed that we would be forced back to a semi-corpuscular theory of the nature of radiant energy? Or, that we would see the atom split? Or, that we would see the transmutation of the elements?

In these encyclopedic chapters one finds much of human interest,—in fact they consist of thumbnail biographical sketches of the great scientists who are responsible for the development of science. Many absorbing stories are incorporated in this volume.

CLYDE FISHER.

THE JEWELED TRAIL

- - - - - - - - by Louis Kornitzer

Sheridan House, $2.75

SOMEWHERE in this book the author says, "This is not a treatise on gems, but a slice of gem studded autobiography." And the reader who has seen his previous books, *The Gem Trader* and *The Pearl Trader* will know what to expect in this work. A life spent in the many phases of the gem business must supply an endless number of anecdotes to be recounted in an autobiography—more dramatic and more exciting, perhaps, than most because of the high stakes for which the game is played. But otherwise the book might as well deal with coffee, spices, or jute. In it we learn little about gems and, as before, we find the lack of that scientific background, so essential to a true appreciation of our gems. Mr. Kornitzer's attitude is probably the universal approach of a successful gem

dealer well versed in his trade: what will sell and what it will bring. He has no knowledge of the events which brought his wares to the places where they were found and little appreciation of the subtle differences between so many of the popular gems. This ignorance leads almost to a disdain for those who are concerned with such matters, though Mr. Kornitzer does not hesitate to refer to others more expert than he when something unusual, such as the pink beryl whose history he recounts, turns up in his business dealings.

Readers of this book should expect only what was to be found in the previous writing of this author. Interesting anecdote succeeds interesting anecdote. Malay pearlers elbow Chinese explorers or London robbers from a fast-changing scene, world-wide in its scope. Like those other works it is good adventure and romance, but here, also, the reader must be very wary in accepting Mr. Kornitzer's scientific statements as fact. But he spins good yarns in which various gems play their parts as "props" in these little dramas from life.

F. H. POUGH.

THE AUDUBON GUIDE TO ATTRACTING BIRDS

- - - - - Edited by John H. Baker

Doubleday, Doran, $2.50

THE authors of this volume have had the advantage of long-continued contact with the public for which they write. They know not only what it wants, but also what it ought to have, and experience has prepared them to speak with authority.

Roger T. Peterson supplies the first seven of the book's twelve chapters. He writes of the methods and equipment of identification in the field, bird photography and banding, attracting by planting, feeding, the use of nesting boxes, providing water, and creation of watered areas. Under these headings he presents a fund of useful information and advice much of which is not to be found elsewhere.

Richard H. Pough, in "Our Attitude Toward Predators," discusses "the balance of nature concept," a subject in which theory and practice do not always harmonize. The same writer also gives an informing chapter called "Trespass and Your Rights." The Editor, Mr. Baker, describes various types of bird sanctuaries and the methods to be employed in their maintenance,—subjects on which he is especially qualified to speak. He also gives us an outline of the organization and field covered by the National Audubon Society, of which he is the Executive Director, and tells us how we may best support its widespread and varied labors.

Pages 226 to 247 contain definite information in regard to planting for birds and the book concludes with a carefully compiled Bibliography. Even this outline of contents will impress us with the importance of this aid to the establishment of better relations between birds and man.

F. M. CHAPMAN.

THE TALL TRUTH

Who Was the First Horticulturist?

By C. H. CURRAN

Associate Curator of Diptera, The American Museum of Natural History

Photo by L. C. Peltier

ONE OF THE STRANGEST TEAMS IN NATURE: the yucca and its moth

MAN prides himself upon the glories of his scientific achievements. As a horticulturist, he has accomplished much, but he is still a beginner and many of his successes have been due to accident, not intent.

In his attempt to increase the yield and beauty of plants, man has crossed carefully selected varieties, and in doing this the flowers must often be pollinated by hand. In order to prevent the flowers from being pollinated from free pollen in the air or by random insects, they must be kept covered.

Thousands upon thousands of years ago the yucca moth began doing what man has only recently learned to do—to pollinate flowers according to a fixed plan. The result is that neither the yucca nor its moth can live alone. The development of this strange relationship is truly one of the most extraordinary things in the world of nature.

To observe the yucca moth at work you must watch just as dusk is falling or on very dark days, because it is a nocturnal insect and hides during the day in the yucca flowers, which are closed in bright light. They open in the evening, and the silky white moths come out and fly from flower to flower.

The first thing the moth does is to visit the stamens and begin gathering a mouthful of pollen. The moth's mouth has become modified to perform the job of gathering and holding the pollen. Having gathered a pellet of the pollen, she flies to the pistil of the flower and presses the pellet into the forked end of the pistil, ensuring a new generation of yuccas. Then, very deliberately, she lays an egg on the pistil, and off she flies.

The egg produces the young caterpillar, which crawls into the developing seed pod of the yucca and there feeds upon the seeds until it is mature. When fully grown, the caterpillar makes its way to the ground and builds a tough, silken cocoon in which to spend the winter. The following year a new moth emerges just in time to repeat the process in a new crop of yucca blossoms. Everything is perfectly timed.

The yucca has become so dependent upon the moth that its flowers cannot be fertilized in any other way. And the moth cannot fertilize any other kind of flower. Nature has so arranged things, furthermore, that the caterpillars do not eat all of the seeds. We can truly say that the yucca moth was the first creature to make a plant truly dependent upon it and that, as far as we know, it was the first horticulturist.

You do not need to go to desert regions to see this remarkable team at work, for yucca plants are grown as ornamentals over most parts of the United States. It is a safe bet that if you walk up to a yucca plant and knock the top of the flower shoot sharply you will see several silvery-white moths fly out. These are the insects that control the well-being of the yucca plant, the insects that are responsible for the next generation of yuccas and which in turn are indebted to the yucca for life itself.

ONE MAN EXPLORER

Continued from page 57

claim that his pugilistic protégé could not be replaced. But Raven testified that *all* kangaroos of that species can "box." When sufficiently prodded by a human antagonist, it is natural for them to brandish their forelegs in a manner vaguely resembling the fistic maneuvers proper to the manly art of self-defense, and about all the "training" required is to tie boxing gloves on their paws.

In one sense the present state of international anarchy is a boon to Raven's reputation as a scholar. At least it keeps him within the confines of one hemisphere, and we may now hope to see an enviable procession of scientific documents flow from his pen. Behind him lies a unique career of exploration wherein he has established himself among the truly great fieldmen of our day. His future is brightened by the opportunity now at hand to assimilate and organize the well-nigh unrivaled wealth of data he has accumulated with quiet distinction in his laboratory from many far-off islands and from the depths of African forests.

MORE THAN A TRIGGER FINGER

By CHARLES H. COLES

Chief Photographer, American Museum of Natural History

Is your equipment ready for your American camera safari?

VACATION time is almost at hand. No matter where you travel you will want to bring home with you the fleeting beauty you encounter. Nothing spells distance and enchantment quite so strongly as strange wildlife,—living pictures of animals completely different from the familiar life of your own "back yard."

Taking movies of wild animals in our national parks is also one of the finest ways of seeing these conservation areas. You will have to get off the beaten track to catch the wary game—but what pictures you can get if you're lucky! Wildlife has interest, motion, grace—everything that a film should contain.

Using regular equipment

The ordinary spring-driven movie camera taking 8 or 16 mm. film is ideal for making wildlife pictures. The portability and lightness of these cameras leaves little to be desired in the way of ease in transportation.

There are two ways of using cameras that are equipped with single lenses without telephoto equipment: in the hand while stalking the game, or on a tripod with remote control on the starting button.

The hand-held camera must be grasped firmly, with the elbows pressed close to the body so that the picture will be sharp and steady upon the screen. Dropping to one knee and resting the elbow of the arm supporting the camera on the bent knee will give an even more solid support to the camera.

A tripod is usually too slow in operation to use when stalking game. By the time the legs are extended the quarry has fled. A single-footed "tripod," called a unipod, sometimes works out very well if kept attached to the camera. When detached it makes a good walking stick. Using this device, the weight of the camera is taken off your arms, so your strength can be used to prevent side sway.

When working rather close to large game it is a good idea to have another person on the lookout for arrivals from other directions. With your eye glued to the finder of the movie camera, you don't have much opportunity to see what is sneaking up behind you, which is perhaps where the best picture is to be had.

Several types of camera grips have been used to facilitate free-hand filming of moving subjects. A hand grip is available that screws into the tripod bushing on the bottom of the camera. It affords a comfortable cylindrical handhold of generous proportions. Holding your camera by this hand grip makes it incidentally an effective club if one of your camera subjects decides he doesn't like photographers, but any animal large enough to be dangerous has rights you will do well to respect.

One filmer has rebuilt a gunstock to take his movie camera so that the familiar shooting stance enables him to utilize the accuracy as well as freedom of motion of his once favorite weapon. He has even rigged up a mechanical linkage so that a pull on a normally placed trigger on the underside of the gunstock depresses the starting button of his movie camera.

If you have found where wildlife is likely to appear within a reasonable time, such as near a salt lick, you can set your camera on a tripod and arrange a remote control so that you may operate the camera from a distance. If your camera operates with a release lever, a cord can be your remote control. With the camera upon a firm tripod, a cord may be wound around the release lever, then led down to the ground and through the loop of a metal skewer which has been pushed into the ground under the tripod. The cord is then run back to where you are going to sit, wait, and hope. A pull on the cord will start the camera and probably cause the wildlife to start also. Cameras operated by pressing a button require a more complicated remote control device that should be constructed by a competent mechanic.

Long range filming

Many animals lead such an aloof existence that it is almost impossible to get close enough with ordinary movie lenses. Rocky Mountain goats prefer the high life in the summer and manage to remain sound in limb although they leap about on rocky crags that would almost worry a housefly. The only way to make satisfactory pictures of such unsociable creatures is with telephoto lenses.

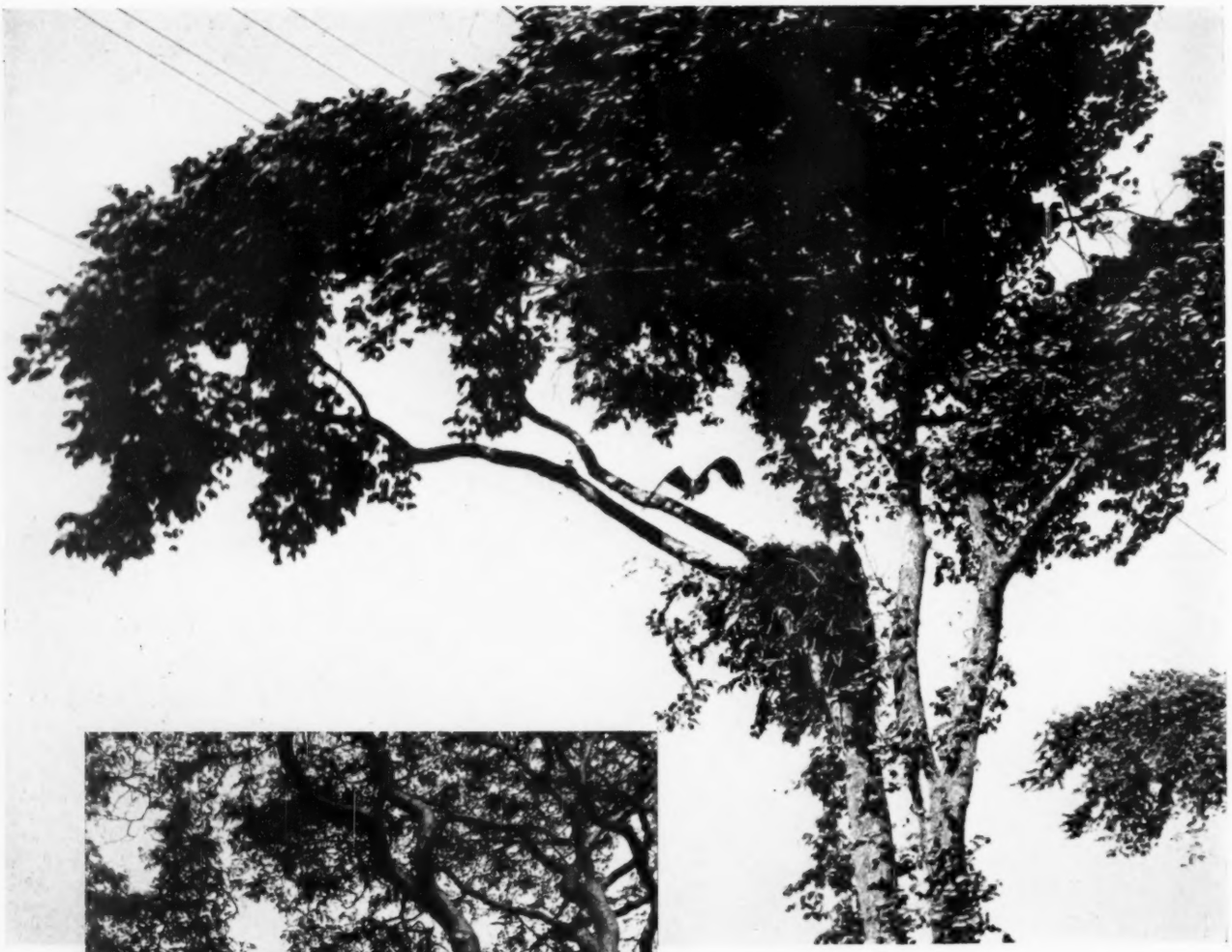
Telephoto lenses come in various sizes, graded according to how much magnification they will achieve. The longest lens usually offered brings a 16 mm. camera apparently six times closer to the subject than it would seem to be. That is, any animal upon which you train this lens appears six times larger on the screen than it would appear if filmed with the regular one-inch lens.

Even more powerful lenses can be adapted to a movie camera by a machinist. When the lenses become too long, however, they require complicated supporting arrangements to prevent them from sagging and pulling the front of the camera out of line.

The trouble with too powerful a lens is that it is hard to get it to point exactly where you want. Unless some means is provided for looking right down the lens to see what it is pointing at, your aim may be pretty bad. Focusing becomes difficult, atmospheric haze interferes, and the image loses its sharpness with excessively long lenses.

The six-inch objective is, therefore, the most powerful telephoto lens normally supplied for small motion-picture cameras. It combines reasonable power and sharpness with not too great physical size. A lens of this type is also excellent for aquatically minded animals when you don't happen to have a boat handy. Movies of birds and small mammals are also much easier with such a telephoto lens. Your close approach with movie camera is then unnecessary, with the result that shy creatures feel less afraid and get used to the intruder more easily. A tripod is strongly recommended for all telephoto work.

Try some real animal films this summer. They make grand film fare for young and old, and the joy of making them is unsurpassed.



ALONG the Rhode Island shore, osprey nests were not difficult to find but were generally inaccessible. This tree was scalable, but the nest contained merely one egg and the parent bird flew menacingly about the intruder

A SINGLE YOUNG OSPREY, not quite old enough to fly but well able to show his anger, occupied this nest. His portrait is shown in the other photographs

LETTERS

—Continued from page 2

SIRS:

Possibly your readers would be interested in seeing some photographs of a bird which they may have observed from a distance without knowing exactly what it was.

If you have stood on the shore with the sea breeze flinging salt into your face and craned your neck to watch a bird that was neither gull nor eagle climb and wheel into the blue or flap straight as an arrow over the trees and inland to its nest, clutching a dripping fish in its talons and uttering a peculiar scream,—that bird was probably an osprey. The accompanying photographs were taken without any telephoto lens, in Rhode Island.

The nature lover may easily understand my desire to follow one of these majestic birds to its home. Being a photography fan, my purpose was not to rob the nest but to secure some good pictures. Consequently, after splashing around for a whole afternoon in a salt water marsh with an ornithologist friend, who was looking for bitterns and some kind of tern, I demanded that before the summer was up he should lead me to a colony of osprey nests.

Our first trip was essentially exploratory and took us to the eastern shore of the Sakonnet River from Tiverton to Little Compton. We used an ancient Model-T and ventured down all the side roads, which were none too good, to find the water. The nests were rather easy to spot, and often the birds themselves would unwittingly direct our gaze. As we bounced along one road, a large female suddenly fluttered out of a near-by tree. She circled and returned now and then to the nest. Her behavior was so strange that we stopped the truck, and I resolved to climb the tree.

The job proved difficult, and I was rather glad to have a sheath knife, because the owner of the nest was persistently diving and making a noisy row. Fear kept her

HE SHIFTED UNEASILY from leg to leg and hissed with rage

SPREADING HIS BEAUTIFUL WINGS to their full three-foot span, he seemed ready to leap at the intruder and sink his talons into an arm. The parents did not oppose the visitors but appeared rather to be deliberately trying to entice the young bird to fly

at a distance, however. Imagine my surprise to find only one egg. The smell of rotten fish was terrific. I slid back to the ground disappointed.

Another time I spotted a whole family of fledglings raucously playing in complete security at the top of an old water tower. When we approached, the young immediately became quiet. The parent birds glided to separate roosts at opposite ends of the field and communicated in shrill screams. Sometimes the male would fly above our heads and behave fiercely. But a rotten wooden ladder terminated in space about 30 feet up, and once more my hopes were dashed.

It was not until our second expedition "into the field" that we met with rare success. At the edge of a pasture we discovered a fine nest in a climbable tree, something very infrequent. We could see what appeared to be an adult bird over the edge, but he never took flight. We were amazed to find that it was a handsome young osprey, restlessly moving about in his ample quarters. He was about 40 or 45 day old and apparently had not yet learned to fly. He shifted uneasily from leg to leg and hissed with rage at the intruders. His yellow eyes gleamed defiance. From time to time he spread his beautiful wings, which were over three feet from tip to tip, and seemed to threaten to leap at one of us and sink his talons into an eye. We left him unharmed. We noticed with surprise that another osprey flew from tree to tree at the far end of the field, but made little fuss. We had expected active resistance. I surmised that the parent birds were deliberately trying to entice the young one to fly, though I may be mistaken. At all events my curiosity was satisfied, even if I did not get a photographic record of the osprey's development from the egg to the flying bird.

R. Z. ZIMMERMANN, JR.

Philadelphia, Pa.

Continued on page 64

LETTERS

Continued from page 63

PUMAS, WOLVES, AND GILA MONSTERS

Two letters have been received recently by NATURAL HISTORY, illustrative of contradictory statements in natural science and of the unfortunate tendency to generalize. The questions posed by these two readers are simplified below, and Dr. J. E. Hill of the Department of Mammalogy in the American Museum attempts to answer them.

Absolute answers frequently cannot be given, if indeed there are any absolutes in the behavior of animals. However,—

1. *Did pumas (also called mountain lions, cougars, or panthers) spring out of trees on horses, sometimes even when a man was riding a horse?* This is extremely unlikely. It is not the custom of pumas to spring from trees on their prey; they usually stalk it and then charge in for the kill. Possibly in the early days of settlement pumas may have attacked men, but in recent years only a very few cases are known, and in each instance the animal was incapable of securing its normal prey. Without a reliable eye-witness, we must reject this story as being quite unlike all observations by trustworthy persons.

2. *Does the male puma or mountain lion act like a good father or does he kill the young if he finds them?* There are two contradictory opinions on this question and insufficient information to decide completely and finally. Also individual pumas may behave differently, just as individual men behave differently.

There are cases recorded of the male puma being found in company with female and young, but the young in each case were not newly born. No one has reported, to my knowledge, a case of the male killing the young. Males fight other males, sometimes to the death; from this it has been inferred that they kill cubs. Individuals might conceivably do so under certain circumstances, but it is not proven. On the other hand most available information indicates that the male does not stay, at least when the young are very small, in the family group and does not secure food for the young.

3. *Did, or do, American wolves ever attack men?* Before rifles were common it is quite possible that wolves occasionally attacked men; there is no reason why they should not have done so. American wolves are not importantly different from Eurasian wolves, and in the Middle Ages there were man-killing wolves in many places in Europe. Today a child, an injured man, or one without a gun might be attacked, and if wolves were in a pack and desperately hungry they might attack even an armed man. However, few wolves are now left anywhere and these have learned to be secretive and cautious where man is concerned, for wolves are highly intelligent.

4. *Are Gila monsters deadly poisonous?* Human beings are not all equally injured by poison, some individuals are much more resistant than others. There are several cases recorded where persons have died from the bite of this poisonous lizard. The venom is as poisonous as that of most rattlesnakes, but the means of getting the poison into the blood and tissues is much less efficient in the Gila monster. A single bite, rather than the chewing and worrying required to get enough venom into the tissues, would probably be more painful than dangerous.

* * *

SIRS:

. . . I like your magazine very much and wish to take the opportunity to tell you how much I like it. It is one of the first-class magazines of the country.

CLARKSON POTTER.

Mendham, N. J.

* * *

Answers to Questions on page 57

1. The Carib Indian's *kanawa*, or dugout canoe, was upward of 60 feet. See page 42
2. False. The pearls of our edible clams and oysters are practically worthless. See page 22
3. Yes. A young sperm whale. The creature met its death (March 13, 1928) in Brooklyn's Gowanus Canal and may now be seen in the Museum's Hall of Ocean Life. See page 55
4. The periodical cicada. After sixteen years and ten months underground as an embryonic animal the insect enjoys about one month of adulthood in sunshine. See page 34
5. (b) Ruby. See page 23
6. The giant squid. Many a mythical sea creature no doubt owes its origin to this ten-tentacled calamary. See page 11
7. The pearl, because the pearl is the only gem measured in terms of grains instead of carats. See page 22
8. False. Pearls, from graves have usually lost their delicate sheen. See page 22
9. A gorge comparable in size to the Grand Canyon is known to exist under the ocean 130 miles off New York City. Its lowest extremity is over one mile below the surface. See page 28
10. Buddha disappeared because it was of butter. This astonishing 20-foot statue was made for the annual Festival of the Fifteenth Day of the First Moon. It was brought out at dusk on the day of the Festival and by morning had melted to a shapeless mass from the heat of numerous butter lamps placed at the base for illumination, according to Harrison Forman, who took this unusual photograph.

HONOR

DR. GEORGE GAYLORD SIMPSON, eminent in the field of paleontology, has received the distinction of election to the National Academy of Sciences, whose membership embraces a selection of the most celebrated names in science. Readers will recall numerous articles by Doctor Simpson in NATURAL HISTORY, which give evidence of the breadth of his interests as well as his outstanding gift for exposition. He is a member of the American Museum's Department of Paleontology, in whose interests he has made numerous expeditions, particularly in South America, and his scientific writings have contributed important new knowledge on the history of mammals and other subjects. His popular book on Patagonia, *Attending Marvels*, has had an enthusiastic reception by the general public.